ENCYCLOPÆDIA BRITANNICA.

VOLUME the THIRD.
Encyclopædia Britannica;

OR, A

DICTIONARY

OF

ARTS and SCIENCES,

COMPILED UPON A NEW PLAN.

IN WHICH

The different SCIENCES and ARTS are digested into
distinct Treatises or Systems;

AND

The various TECHNICAL TERMS, &c. are explained as they occur
in the order of the Alphabet.

ILLUSTRATED WITH ONE HUNDRED AND SIXTY COPPERPLATES.

By a SOCIETY of GENTLEMEN in SCOTLAND.

IN THREE VOLUMES.

VOL. III.

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M. DCC. LXXI.
Macao, an island of China, in the province of Canton, fifty miles south of Canton. Macao, in ornithology. See Psittacus. Maccabees, two apocryphal books of scripture; so called from Judas Mattathias, surnamed Maccabeus. The first book of the Maccabees is an excellent history, and comes nearest to the style and manner of the sacred historians of any extant. It contains the history of forty years, from the reign of Antiochus Epiphanes to the death of Simon the high priest; that is, from the year of the world 3829 to the year 3869, 131 before Christ. The second book of the Maccabees begins with two epistles sent from the Jews of Jerusalem to the Jews of Egypt and Alexandria, to exhort them to observe the feast of the dedication of the new altar erected by Judas on his purifying the temple. After these epistles follows the preface of the author to his history, which is an abridgment of a larger work, composed by one Jason, a Jew of Cyrene, who wrote the history of Judas Maccabees and his brethren, and the wars against Antiochus Epiphanes and Eupator his son. This second book does not, by any means, equal the accuracy and excellency of the first. It contains a history of about fifteen years, from the execution of Hellenicus’s commission, who was sent by Seleucus to fetch away the treasures of the temple, to the victory obtained by Judas Maccabees over Nicanor; that is, from the year of the world 3828, to the year 3843, 147 years before Christ.

Macclesfield, a market-town of Cheshire, thirty-five miles east of Chester, from whence the noble family of Parker take the title of earl.

Mace, the second coat or covering of the kernel of the nutmeg, is a thin and membranaceous substance, of an oleaginous nature and a yellowish colour; being met with in flakes of an inch and more in length, which are divided into a multitude of ramifications. It is of an extremely fragrant, aromatic and agreeable flavour, and of a pleasant, but acrid and oleaginous taste. Mace is carminative, flatulentic, and astrigent; and possesses all the virtues of nutmeg, but is less astrigent.

Macedonia, a province of European Turkey, bounded by Servia and Romania, on the north and east; by the gulfs of Salonichi, Contra, and Thessaly, on the south; and by Albania and Epirus, on the west.

Maceration, is an infusion of, or soaking ingredients in water or any other fluid, in order either to soften them, or draw out their virtues.

Machine, in general, whatever hath force sufficient to raise or drop the motion of a heavy body. See Mechanics.

Machinery, in epic and dramatic poetry, is when the poet introduces the use of machines, or brings some supernatural being upon the stage, in order to solve some difficulty, or to perform some exploit out of the reach of human power. See Composition.

Mackeran, or Makan, the capital of a province in Persia of the same name; situated in E. long. 66°, and N. lat. 26°.

Mackerel, in ichthyology. See Scomber.
MACRÓCERCI, a name given to that class of animal-cules, with tails longer than their bodies.

MACRÓPYRENIUM, in natural history, a genus of fossils, consisting of crinoid cephalopods, with a long nucleus standing out at each end of the masts.

MACRÓTELÔSTYLA, in natural history, a name of a genus of crustaceans, which are composed of two pyramids, joined to the end of a column; both the pyramids, as also the column, being hexagonal, and the whole body consequently composed of eighteen planes.

MACULE, in astronomy, dark spots appearing on the luminous faces of the sun, moon, and even some of the planets. See Astronomy.

These spots are most numerous and easily observed in the sun. It is not uncommon to see them in various forms, magnitudes, and numbers, moving over the sun's disk. They were first of all discovered by the lynean astronomer Galileo, in the year 1610, soon after he had finished his new-invented telescope.

MAD APPLE. See RUßIA.

MADAGASCAR, or St. Laurence, an island of Africa, situated between 43° and 51° of east longitude, and between 12° and 26° south latitude, three hundred miles south-east of the continent of Africa. It is about a thousand miles in length from north to south, and generally between two and three hundred miles broad. The country is divided among a great number of petty sovereigns.

MADDER. See RUßIA.

MADÉRAS, a river which arises in Burgundy, and runs through Lorraine and Champagne into the Netherlands, and at last, after passing by many considerable towns, discharges itself into the German sea, a little below the Briel.

MAESTRÌCHT, a town in the province of Brabant, situated on the river Meuse, thirteen miles north of Liege: E. long. 5° 40', and N. lat. 50° 55'.

MAGADOXÁ, the capital of the territory of the same name, at the mouth of the river Magadoxa, on the coast of Anian, in Africa: E. lon. 41°, and N. lat. 2°.

MAGÁNOXÁ, a place in which stores are kept, of arms, ammunition, provisions, &c. Every fortified town ought to be furnished with a large magazine, which should contain stores of all kinds, sufficient to enable the garrison and inhabitants to hold out a long siege, and in which smiths, carpenters, wheelwrights, &c. may be employed, in making every thing belonging to the artillery, as carriages, wagons, &c.

MAGÁLEN, or NÁMI OF ST. MAGÁLEN, an order of religious in the Roman church, dedicated to St. Mary Magdalene, and sometimes called Magdalenes. These chiefly consist of courtesans, who, quitting their profession, devote the rest of their lives to repentance and mortification.

MAGDEBURG, the capital of the duchy of the same name, situated on the river Elbe, seventy miles west of Berlin: E. long. 12°, and N. lat. 52° 15'.

MAGDELENE, a large river of South America, which, rising near the equator, runs north through Terra Firma, and, uniting its waters with the river Cance, obtains the name of the river Grande, and falls into the north sea, below the town of Madre de Popa.

MAGELLÁN, or STREIGHTS, or rather STREIGHTS OF MAGELLÁN, These straits are about three hundred miles in length from the Atlantic to the Pacific ocean, but of a very unequal breadth; and were at first discovered and passed by Ferdinand Magellan, from whom they had their name: they are situated between the island Terra del Fuego and the most southern part of the continent of America, between 76° and 84° of W. long. and between 52° and 54° of south lat.

MAGI, or MAGIANs, an ancient religious sect in Persia and other eastern countries, who maintained, that there were two principles, the one the cause of all good, the other the cause of all evil; and, abominating the adoration of images, worshipped God only by fire, which they looked upon as the brightest and most glorious symbol of Oromades, or the good God; as darkness is the truest symbol of Aryanus, or the evil god. This religion was reformed by Zoroaster, who maintained that there was one supreme independent being; and under him two principles or angels, one the angel...
of goodness and light, and the other of evil and darkness: that there is a perpetual struggle between them, which shall last to the end of the world; that then the angels of darkness and his disciples shall go into a world of their own, where they shall be punished in everlasting darkness; and the angel of light and his disciples shall also go into a world of their own, where they shall be rewarded in everlasting light.

The priests of the magi were the most skilful mathematicians and philosophers of the ages in which they lived, insomuch that a learned man and a magician became equivalent terms. The vulgar looked on their knowledge as more than natural, and imagined them inspired by some supernatural power; and hence those who practised wicked and mischievous arts, taking upon themselves the name of magians, drew on it that ill signification which the word magician now bears among us.

This fact still subsists in Persia, under the denomination of gars, where they watch the sacred fire with the greatest care, and never suffer it to be extinguished.

MAGIC, originally signified only the knowledge of the more sublime parts of philosophy; but as the magi likewise professed alchemy, divination and forcery, the term magi became odious, being used to signify an unlawful diabolical kind of science, acquired by the affiduous work of the devil and departed souls.

Magic lantern, in optics. See Optics.

MAGISTERY, in chemistry, a very fine powder made by solution and precipitation.

Magistry of Bifmuth. See Chemistry, p. 90.

MAGISTRATE, any public officer to whom the executive power of the law is committed, either wholly or in part.

Magna assisa eligenda, is a writ anciently directed to the sheriff for summoning four lawful knights before the justices of assize, in order to choose twelve knights of the neighbourhood, &c. to pass upon the great assize between such a person plaintiff, and such a one defendant.

Magna charta, the great charter of the liberties of Britain, and the basis of our laws and privileges.

This charter may be said to derive its origin from king Edward the Confessor, who granted several privileges to the church and state by charter: these liberties and privileges were also granted and confirmed by king Henry I. by a celebrated great charter now lost; but which was confirmed or re-enacted by king Henry II. and king John. Henry III. the successor of this just prince, after having caused twelve men to make inquiry into the liberties of England in the reign of Henry I. granted a new charter, which was the same as the present magna charta: this he several times confirmed, and as often broke; till, in thirty-seventh year of his reign, he went to Westminster-hall, and there, in the presence of the nobility and bishops, who held lighted candles in their hands, magna charta was read, the king all the while holding his hand to his breast, and at last solemnly swearing faithfully and inviolably to observe all the things therein contained, &c. then the bishops extinguishing the candles, and throwing them on the ground, they all cried out, "Thus let him be extinguished, and flack in hell, who violates this charter." It is observed, that notwithstanding the solemnity of this confirmation, king Henry, the very next year, again invaded the rights of his people, till the barons entered into a war against him, when, after various successes, he confirmed this charter, and the charter of the forei, in the fifty second year of his reign. This excellent charter, so equitable and beneficial to the subject, is the ancient charter written in the kingdom: by the 25 Edw. I. it is ordained that it shall be taken as the common law; and by the 43 Edward III. all statutes made against it are declared to be void.

MAGNESIA. See Chemistry, p. 119.

Magnet, or Loadstone, in natural history, a very rich iron ore, found in large detached masses, of a dusky iron-grey, often tinged with brownish or reddish, and when broken appearing something like the common emery, but less sparkling. It is very heavy, considerably hard, of a perfectly irregular and uneven surface, and of a firm structure, but usually with some porous irregularities within. It is found in Britain, and all other places where there are iron mines. See Mechanics.

Magnifying, the making of objects appear larger than they would otherwise do; whence convex lenses, which have the power of doing this, are called magnifying glasses. See Optics.

MAGNITUDE, whatever is made up of parts locally extended, or that hath several dimensions; as a line, surface, solid, &c.

Magnolia, in botany, a genus of the polyandria class. The calix consists of three leaves, and the corolla of nine petals; the capsules are imbricated, and have two valves; and the seed is a pendulous berry. There are four species, all natives of America.

Magpy, in ornithology. See Corvus.

Mahometans, those who believe in the religion and divine million of Mahomet, or Mohammed.

It will not be improper here to give a general account of this extraordinary person, and the religion which he had the address to propagate over most of the eastern nations.

Mohammed was born in the reign of Anushirwan the Jutt, emperor of Persia, about the end of the 6th century of the Christian era. He came into the world under some disadvantages. His father Abd'allah was a younger son of Abd'almotalleb, and, dying very young; and in his father's life time, left his widow and infant son in very mean circumstances, his whole substance consisting but of five camels and one Ethiopian slave. Abd'alma'tleb was therefore obliged to take care of his grandchild Mohammed, which he not only did during his life, but at his death enjoined his eldest son Abu Taleb, who was brother to Abd'allah by the same mother, to provide for him for the future; which he very affectionately did, and instructed him in the business of a merchant which he followed; and to that end he took him into Syria when he was but thirteen, and
and afterwards recommended him to Khadijah, a noble and rich widow, for her factor; in whose service he behaved himself so well, that by making him her husband the soon raised him to an equality with the richest in Mecca.

After he began by this advantageous match to live at his ease, it was that he formed the scheme of establishing a new religion, or, as he expressed it, of replanting the only true and ancient one, professed by Adam, Noah, Abraham, Moses, Jesus, and all the prophets, by destroying the gross idolatry into which the generality of his countrymen had fallen, and weeding out the corruptions and superstitions which the latter Jews and Christians had, as he thought, introduced into their religion, and reducing it to its original purity, which confided chiefly in the worship of one only God.

Before he made any attempt abroad, he rightly judged that it was necessary for him to begin with the conversion of his own household. Having therefore retired with his family, as he had done several times before, to a cave in mountain Hara, he there opened the secret of his mission to his wife Khadijah; and acquainted her that the angel Gabriel had just before appeared to him, and told him that he was appointed the apostle of God; and also repeated to her a passage which he pretended had been revealed to him by the minister of the angel, with those other circumstances of this first appearance, which are related by the Mohammedan writers. Khadijah received the news with great joy; flattering by his whole hands her soul was, that she trusted he would be the prophet of his nation; and immediately communicated what she had heard to her cousin Warakah Ebn Nawfal, who, being a Christian, could write in the Hebrew character, and was tolerably well versed in the scriptures; and he as readily came into her opinion, affuring her that the same angel who had formerly appeared unto Moses was now sent to Mohammed. The first overture the prophet made in the month of Ramadan, in the fortieth year of his age, which is therefore usually called the year of his mission.

Encouraged by so good a beginning, he resolved to proceed, and try for some time what he could do by private persuasion, not daring to hazard the whole affair by exposing it too suddenly to the public. He soon made profelytes of those under his own roof, viz. his wife Khadijah, his servant Zeid Ebn Harethah (to whom he gave his freedom on that occasion, which afterwards became a rule to his followers) and his cousin and pupil Ali, the son of Abu Taleb, though then very young: but this laft, making no account of the other two, used to style himself the first of believers. The next person Mohammed applied to was Abd’allah Ebn Abi Kohafa, surnamed Abu Beer, a man of great authority among the Koreith, and one whose interest he well knew would be of great service to him; as it soon appeared: for Abu Beer, being gained over, prevailed also on Othman Ebn Affan, Abd’ alrahm Ebn Awf, Saad Ebn Abi Wakkas, al Zobeir Ebn al Awam, and Telha Ebn Obeid’dallah, all principal men of Mecca, to follow his example. These men were the six chief companions, who, with a few more, were converted in the space of three years; at the end of which, Mohammed having, as he hoped, a sufficient interest to support him, made his mission no longer a secret, but gave out that God had commanded him to admonish his near relations, and, in order to do it with more convenience and prospect of success, he directed Ali to prepare an entertainment, and invite the sons and descendants of Abd’almutalleb, intending then to open his mind to them: this was done, and about forty of them came; but Abu Laheb, one of his uncles, making the company break up before Mohammed had an opportunity of speaking, obliged him to give them a second invitation the next day; and when they were come, he made them the following speech: "I know no man in all Arabia who can offer his kindred a more excellent thing than I now do you: I offer you happiness both in this life, and in that which is to come; God Almighty hath commanded me to call you unto him; Who therefore among you will be assistant to me herein, and become my brother and my vicegerent? All of them he tapering, and declining the matter, Ali at length rose up, and declared that he would be his assistant; and vehemently threatened those who should oppose him. Mohammed upon this embraced Ali with great demonstrations of affection, and desired all who were present to hearken to and obey him, as his deputy; at which the company broke out into a great laughter, telling Abu Taleb that he must now pay obedience to his son.

This repulse however was so far from discouraging Mohammed, that he began to preach in public to the people, who heard him with some patience, till he came to upbraid them with the idolatry, obstinacy, and perseverance of themselves and their fathers; which so highly provoked them, that they declared themselves his enemies, and would soon have procured his ruin, had he not been protected by Abu Taleb. The chief of the Koreith warmly solicited this perilon to defy his nephew, making frequent remonstrances against the innovations he was attempting; which proving ineffectual, they at length threatened him with an open rupture, if he did not prevail on Mohammed to desist. At this Abu Taleb was so far moved, that he earnestly dissuaded his nephew from pursuing the affair any farther, representing the great danger he and his friends must otherwise run. But Mohammed was not to be intimidated, telling his uncle plainly, that if they set the sun against him on his right hand, and the moon on his left, he would not leave his enterprise: and Abu Taleb, seeing him so firmly resolved to proceed, used no further arguments, but promised to stand by him against all his enemies.

The Koreith, finding they could prevail neither by fair words nor menaces, tried what they could do by force and ill treatment; using Mohammed’s followers so very injuriously, that it was not safe for them to continue at Mecca any longer; whereupon Mohammed gave leave to such of them as had not friends to protect them to seek for refuge elsewhere. And accordingly, in the fifth year of the prophet’s mission, sixteen of them, four of whom were women, fled into Ethiopia; and among them Othman Ebn Affan and his wife Rakiath, Mohammed’s daughter. This was the first flight; but afterwards several others followed them, retiring one after another, to the number of eighty-three men and eighteen women, besides
besides 'children. These refugees were kindly received by the Najafhi, or king of Ethiopia, who refused to deli-
ver them up to those whom the Koréih sent to demand them, and, as the Arab writers unanimously attest, even professed the Mohammedan religion.

In the sixth year of his million Mohammed had the pleasure of seeing his party strengthened by the conver-
sion of his uncle Hamza, a man of great valour and merit, and of Omar Ebn al Khattab, a person highly esti-
mated, and once a violent opponent of the prophet. As persecution generally advances rather than obstructs the spreading of a religion, Ilamamit made so great a progress among the Arab tribes, that the Koréih, to suppress it effectually, if possible, in the seventh year of Mohammed's million, made a solemn league or covenant against the Ha-

themites and the family of Abd'almotalleb, engaging them to contract no marriages with any of them, and to have no communication with them; and, to give it the greater sanction, reduced it into writing, and laid it up in the Caaba. Upon this the tribe became divided into two factions; and the family of Hashem all repaired to Abu Taleb, as their head; except only Abd'al Uzza, surnamed Abu Beih, who, out of his inveterate hatred to his nephew and his doctrine, went over to the opposite party, whose chief was Abu Sofian Ebn Harb, of the family of Ommeya.

The families continued thus at variance for three years; but, in the tenth year of his mission, Mohammed told his uncle Abu Taleb, that God had manifestly shewed his disapprobation of the league which the Koréih had made against them, by sending a worm to eat out every word of the instrument, except the name of God. Of this accident Mohammed had probably some private notice; for Abu Taleb went immediately to the Koréih and acquainted them with it; offering, if it proved false, to deliver his nephew up to them; but, in case it were true, he insinuated that they ought to lay aside their animo-
sity, and annul the league they had made against the Hashemites. To this they acquiesced, and, going to in-
spect the writing, to their great astonishment found it to be as Abu Taleb had said; and the league was thereupon declared void.

In the same year Abu Taleb died, at the age of above fourscore; and it is the general opinion that he died an infulder; though others say, that when he was at the point of death he embraced Mohammedism, and produce some paffages out of his poetical compositions to confirm their assertion. About a month, or, as some write, three days after the death of this great benefactor and patron, Moh-

ammed had the additional mortification to lose his wife Khadijah, who had so generously made his fortune. For which reason this year is called the year of mourning.

On the death of these two persons the Koréih began to be more troublesome than ever to their prophet, and especially some who had formerly been his intimate friends; insomuch that he found himself obliged to seek shelter elsewhere, and first pitched upon Tayef, about sixty miles east from Mecca, for the place for his retreat. Thither therefore he went, accompanied by his servant Zied, and applied himself to two of the chief of the tribe of Thakif who were the inhabitants of that place; but they received them very coldly. However, he stayed there a month; and fome of the more confiderate and better fort of men treated him with a little respect; but the slaves and inferior people at length rose against him, and, bringing him to the wall of the city, obliged him to depart, and return to Mecca; where he put himself under the protection of al Motaam Ebn Adi.

This repulse greatly discouraged his followers; ho-
ever, Mohammed was not wanting to himself, but boldly continued to preach to the public assemblies at the pilgrim-

age, and gained several profelytes, and among them fix of the inhabitants of Yathreb of the Jewish tribe of Khazraj, who, on their return home, failed not to speak much in commendation of their new religion, and ex-

horted their fellow-citizens to embrace the fame.

In the twelfth year of his mission it was that Moham-
ed gave out that he had made his night journey from Mecca to Jerusalem and thence to heaven, so much spoken of by all that write of him. Dr Prideaux thinks he invented it, either to anwer the expectations of thofe who demanded some miracle as a proof of his mission; or else, by pretending to have conversed with God, to effa-

hish the authority of whatever he should think fit to leave behind by way of oral tradition, and make his fayings to serve the fame purpofe as the oral law of the Jews. But it does not appear that Mohammed himself ever expected to fave a great regard should be paid to his fayings, as his followers have fince done; and feing he all along dif-

claimed any power of performing miracles, it feems ra-
ther to have been a fearch of policy to raife his reputation, by pretending to have actually converfed with God in heaven, as Moses had heretofore done in the mount, and to have received fome institutions immediately from him, whereas before he contented himself with persuading them that he had all by the miniftiy of Gabriel.

However, this fery appeared fo abfurd and incredible, that several of his followers left him upon it; and had prob-
ably ruined the whole design, had not Abu Beer vouched for his veracity, and declared that, if Mohammed af-

firmed it to be true, he verily believed the whole. Which happy accident not only retrieved the prophet's credit, but increased it to such a degree, that he was fecure of being able to make his disciples fwallow whatever he pleased to impose on them for the future. And this fcorion, notwithstanding its extravagance, was one of the moft artful contrivances Mohammed ever put in practice, and what chiefly contributed to the rafing of his reputation to that great height to which it afterwards arrived.

In this year, called by the Mohammedans the accepted year, twelve men of Yathreb or Medina, of whom ten were of the tribe of Khazraj, and the other two of that of Aws, came to Mecca, and took an oath of fidelity to Mohammed at al Akaba, a hill on the north of that city. This oath was called the women's oath; not that any wo-
men were present at this time, but because a man was not thereby obliged to take up arms in defence of Moh-

ammed or his religion; it being the fame oath that was afterwards exacted of the women, the form of which we have in the Koran, and is to this effect; viz. That they should renounce all idolatry; and they should not steal, nor commit fornication, nor kill their children (as the
Pagan Arabs used to do when they apprehended they should not be able to maintain them,) nor forge calumnies; and that they should obey the prophet in all things that were reasonable. When they hadsolemly engaged to all this, Mohammed sent one of his disciples, named Masab, to Medina, to inform them more fully of what they should do. 

When Masab arrived at Medina, by the assent and assistance of those who had been formerly converted, gained several profeffors of the new religion, particularly Osaid Ebn Hodeira, a chief man of the city, and Saad Ebn Moahd, prince of the tribe of Aws; Mohammedism spreading so fast, that there was scarce a house wherein there were not some who had embraced it.

The next year, being the thirteenth of Mohammed's mission, Masab returned to Mecca, accompanied by seventy-three men and two women of Medina who had professed Islamism, besides some other people who were as yet unbelievers. On their arrival, they immediately forewarned Mohammed, and offered him their assistance, of which he was now in great need; for his adherents were by this time grown so powerful in Mecca, that he could not stay there much longer without imminent danger. Wherefore he accepted their proposal, and met them one night, by appointment at al Akaba above-mentioned, attended by his uncle al Abbas, who, though he was not then a believer, wished his nephew well, and made a speech to those of Medina, wherein he told them, that as Mohammed was obliged to quit his native city, and seek an asylum elsewhere, and they had offered him their protection, they would do well not to deceive him; that if they were not firmly resolved to defend, and not betray him, they had better declare their minds, and let him provide for his safety in some other manner. Upon their professing their sincerity, Mohammed swore to be faithful to them, on condition that they should protect him against all insults; as heartily as they would their own wives and families. They then asked him how they were to compensate them, if they should happen to be killed in his quarrel; he answered, paradise. Whereupon they pledged their faith to him, and so returned home; after Mohammed had chosen twelve out of their number, who were to have the same authority among them as the twelve apostles of Christ had among his disciples.

Hitherto Mohammed had propagated his religion by fair means, so that the whole fuccefs of his enterprise, before his flight to Medina, must be attributed to persuasion only, and not to compulsion. For before this second oath of fealty or inauguration at al Akaba, he had no permission to use any force at all; and in several places of the Koran, which he pretended were revealed during his stay at Mecca, he declares his business was only to preach and admonish; that he had no authority to compel any person to embrace his religion; and that, whether people believe or not, was none of his concern, but belonged soley unto God. And he was so far from allowing his followers to use force, that he exhorted them to bear patiently those injuries which were offered them on account of their faith; and, when persecuted himself, chose rather to quit the place of his birth and retire to Medina, than to make any refistance. But this great passiveness and moderation seem entirely owing to his want of power, and the great superiority of his opponents; for the first twelve years of his mission; for no sooner was he enabled, by the assent of those of Medina, to make head against his enemies, than he gave out, that God had allowed him and his followers to defend themselves against the infidels; and at length, as his forces increased, he pretended to have the divine leave even to attack them; and to destroy idolatry, and set up the true faith by the sword; finding, by experience, that his designs would otherwise proceed very slowly, if they were not utterly overthrown; and knowing, on the other hand, that innovators, when they depend solely on their own strength, and can compel, seldom run any risk; from whence, says Machiavel, it follows, that all the armed prophets have succeded, and the unarmed ones have failed. Moses, Cyrus, Theseus, and Romulus, would not have been able to establish the observance of their institutions for any length of time, had they not been armed. The first passage of the Koran which gave Mohammed the permission of defending himself by arms, is said to have been that in the twenty-second chapter; after which a great number to the same purpose were revealed.

That Mohammed had a right to take up arms for his own defence against his unjust persecutors, may, perhaps, be allowed; but whether he ought afterwards to have made use of that means for the establishing of his religion, is not so easy to determine. How far the secular power may or ought to interfere in affairs of this nature, mankind are not agreed. The method of converting by the sword gives no very favourable idea of the faith which is so propagated, and is disapproved by every body in those of another religion, though the same persons are willing to admit of it for the advancement of their own; supposing that, though a false religion ought not to be established by authority, yet a true one may; and accordingly force is almost as constantly employed in these cases by those who have the power in their hands, as it is constantly complained of by those who suffer the violence.

It is certainly one of the most convincing proofs that Mohammedism was no other than a human invention, that it owed its progress and establishment almost entirely to the sword; and it is one of the strongest demonstrations of the divine original of Christendom, that it prevailed against all the force and powers of the world by its mere dint of its own truth, after having stood the assaults of all manner of persecutions, as well as other oppositions, for three hundred years together, and at length made the Roman emperors themselves submit thereto; after which time, indeed, this proof seems to fail, Christendom being then established, and Paganism abolished, by public authority, which has had great influence in the propagation of the one and destruction of the other ever since. But to return:

Mohammed, having provided for the security of his companions as well as his own, by the league offensive and defensive which he had now concluded with those of Medina, directed them to repair thither, which they accordingly did; but himself with Abu Beer and Ali stayed behind, having not yet received the divine permission, as

...
he pretended, to leave Mecca. The Korish, fearing the consequence of this new alliance, began to think it absolutely necessary to prevent Mohammed's escape to Medina; and having held a council thereon, after several milder expedients had been rejected, they came to a resolution that he should be killed; and agreed that a man should be chosen out of every tribe for the execution of this design; and that each man should have a blow at him with his sword, that the guilt of his blood might fall equally on all the tribes, to whose united power the

This conspiracy was scarce formed, when, by some means or other, it came to Mohammed's knowledge; and he gave out that it was revealed to him by the angel Gabriel, who had now ordered him to retire to Medina. Whereupon, to amuse his enemies, he directed Ali to lie down in his place, and wrap himself up in his green cloak, which he did; and Mohammed escaped miraculously, as they pretend, to Abu Beer's house, unperceived by the conspirators, who had already assembled at the prophet's door. They, in the mean time, looking through the crevice, and seeing Ali, whom they took to be Mohammed himself, asleep, continued watching there till morning, when Ali arose, and they found themselves deceived.

From Abu Beer's house Mohammed and he went to a cave in mount Thur, to the south-east of Mecca, accompanied only by Amer Ebn Foheirah, Abu Beer's servant, and Abd'Allah Ebn Oreitah, an idolater whom they had hired for a guide. In this cave they lay hid three days, to avoid the search of their enemies; which they very narrowly escaped, and not without the assistance of more miracles than one; for some say that the Korish were struck with blindness, so that they could not find the cave; others, that after Mohammed and his companions were got in, two pigeons laid their eggs at the entrance, and a spider covered the mouth of the cave with her web, which made them look no farther. Abu Beer, seeing the prophet in such imminent danger, became very forrowful; whereupon Mohammed comforted him with these words, recorded in the Koran, *Bk not grieved, for God is with us.* Their enemies being retired, they left the cave, and set out for Medina, by a by road; and having fortunately, or, as the Mohammedans tell us, miraculously escaped some who were sent to pursue them, arrived safely at that city; when Ali folio ved them in three days, after he had settled some affairs at Mecca.

The first thing Mohammed did after his arrival at Medina, was to build a temple for his religious worship, and a house for himself, which he did on a parcel of ground which had before served to put camels in, or, as others tell us, for a burying-ground and belonged to Sahal and Sohal, the sons of Amr, who were orphans. This action Dr Prideaux explains against, representing it as a flagrant instance of injustice; for that, says he, he violently deftroyed these poor orphans, the sons of an inferior artificer (whom the author he quotes calls a carpenter) of this ground, and so founded the first fabric of his worship with the like wickedness as he did his religion. But, to fav nothing of the improbability that Mohammed should act in so impolitic a manner at his first coming, the Moham-

medan writers set this affair in a quite different light: one tells us that he treated with the lads about the price of the ground, but they feared he would accept it as a present: however, as historians of good credit assure us, he actually bought it; and the money was paid by Abu Beer. Besides, had Mohammed accepted it as a present, the orphans were in circumstances sufficient to have afforded it; for they were of a very good family, of the tribe of Najjar, one of the most illustrious among the Arabs, and not the sons of a carpenter. As Dr Prideaux's author writes, who took the word Najjar, which signifies a carpenter, for an appellative, whereas it is a proper name.

Mohammed, being securely settled at Medina, and able not only to defend himself against the insults of his enemies, but to attack them, began to send out small parties to make reprisals on the Korish; the first party consisting of no more than nine men, who intercepted and plundered a caravan belonging to that tribe, and in the action took two prisoners. But what established his affairs very much, was the foundation on which he built all his succeeding greatness, was the gaining of the battle of Bedr, which was fought in the second year of the Hejra, and is so famous in the Mohammedan history. Some reckon no less than twenty-seven expeditions wherein Mohammed was personally present, in nine of which he gave battle, besides several other expeditions in which he was not present. His forces he maintained partly by the contributions of his followers for this purpose, which he called by the name of *zacat* or alms, and the paying of which he very artfully made one main article of his religion; and partly by ordering a fifth part of the plunder to be brought into the public treasury for that purpose, in which matter he likewise pretended to act by the divine direction.

In a few years by the success of his arms (notwithstanding he sometimes came off by the worst) he considerably raised his credit and power. In the fifth year of the Hejra he set out with 1400 men to visit the temple of Mecca, not with any intent of committing hostilities, but in a peaceable manner. However, when he came to al Hodeibiya, which is situate partly within and partly without the sacred territory, the Korish went to let him know that they would not permit him to enter Mecca, unless he forced his way; whereupon he called his troops about him, and they all took a solemn oath of fealty or homage to him, and he resolved to attack the city; but those of Mecca sending Arwa Ebn Mafud, prince of the tribe of Thakif, as their ambassador, to defign peace, a truce was concluded between them for ten years, by which any person was allowed to enter into league either with Mohammed, or with the Koreish, as he thought fit. It may not be improper to shew the inconceivable veneration and respect the Mohammedans by this time had for their prophet, to mention the account which the above-mentioned ambassador gave the Koreish, at his return of their behaviour. He said he had been at the courts both of the Roman emperor and of the king of Persia, and never saw any prince so highly respected by his subjects as Mohammed was by his companions; for, whenever he made the ablution, in order to say his prayers, they ran and caught the water that he had used; and, whenever he spit, they immediately licked it up, and gathered it in a skin, as a mark of respect.
ed up every hair that fell from him with great superfluition. In the eleventh year of the Hejra, Mohammed began to think of propagating his religion beyond the bounds of Arabia, and sent messengers to the neighbouring princes, with letters to invite them to Mohammedism. Nor was this project without some success. Khofru Parviz, then king of Persia, received his letter with great disfain, and tore it in a passion, fending away the messenger very abruptly; which when Mohammed heard, he said, God shall tear his kingdom. And soon after a messenger came to Mohammed from Badhan king of Yaman, who was a dependent on the Persians, to acquaint him that he had received orders to send him to Khofru. Mohammed put off his answer till the next morning, and then-told the messenger it had been revealed to him that night that Khofru was slain by his son Shiryeh; adding, that he was well assured his new religion and empire should rise to as great a height as that of Khofru; and therefore bid him advise his master to embrace Mohammedism. The messenger being returned, Badhan in a few days received a letter from Shiryeh, informing him of his father's death, and ordering him to give the prophet no further disturbance. Whereupon Badhan and the Persians with him turned Mohammedans.

The emperor Heraclius, as the Arabian historians assure us, received Mohammed's letter with great respect, laying it on his pillow, and diffimmed the bearer honourably. And some pretend that he would have professed this new faith, had he not been afraid of losing his crown. Mohammed wrote to the fame effect to the king of Ethiopia, though he had been converted before, according to the Arab writers; and to Mokawkas, governor of Egypt, who gave the messenger a very favourable reception, and sent several valuable presents to Mohammed, and among the rest two girls, one of which, named Mary, became a great favourite with him. He also sent letters of the like purport to several Arab princes; particularly one to al Hareth Ebn Abi Shamer king of Ghaffan, who returning for answer that he would go to Mohammed himself, the prophet said, May his kingdom perish; another to Hawdha Ebn Ali, king of Yamama, who was a Chriftian, and, having some time before professed Islamifm, had lately returned to his former faith; this prince sent back a very rough answer, upon which Mohammed cursing him, he died soon after; and a third to al Mondar Ebn Sawa, king of Bahrin, who embraced Mohammedism, and all the Arabs of that country followed his example.

The eighth year of the Hejra was a very fortunate year to Mohammed. In the beginning of it, Khaled Ebn al Walid and Anuru Ebn al As, both excellent fouldiers, the firit of whom afterwards conquered Syria and other countries, and the latter Egypt, became profeffors of Mohammedifm. And soon after the prophet sent 3000 men against the Grecian forces, to revenge the death of one of his ambafladors, who being fent to the governor of Bohra on the fame errand as thofe who went to the above-mentioned princes, were slain by an Arab, of the tribe of Ghaffan, at Muta, a town in the territory of Balka in Syria, about three days journeycaftward from Jerufalem, near which town they encountered. The Grecians being wafily superior in number (for, including the auxiliary
In the tenth year Ali was sent into Yaman to propagate the Mohammedan faith there, and, as it is said, converted the whole tribe of Hamdan in one day. Their example was quickly followed by all the inhabitants of that province, except only those of Najran, who, being Christians, chose rather to pay tribute.

Thus was Mohammedism established, and idolatry rooted out, even in Mohammed's life-time (for he died the next year) throughout all Arabia, except only Yama-

ma, where Mosfeisana, who set up also for a prophet as Mohammed's competitor, had a great party, and was not reduced till the Khalifat of Abu Beer: and the Arabians, being then united in one faith and under one prince, found themselves in a condition of making those conquests, which extended the Mohammedan faith over so great a part of the world.

Of the Koran. The word Koran, derived from the verb karaa, to read, signifies properly, in Arabic, the reading, or, rather, that which ought to be read; by which name the Mohammedans denote not only the entire book or volume of the Koran, but also any particular chapter or section of it; just as the Jews call either the whole scripture, or any part of it, by the name of Karah, or Mikra, words of the same origin and import. See Al-

CORAN.

Besides this peculiar name, the Koran is also honoured with several appellations, common to other books of scripture: as, al Farkan, from the verb foraka, to di-

wide or distinguish; not, as the Mohammedan doctors say, because those books are divided into chapters or sections, or distinguishing between good and evil; but in the same notion that the Jews use the word Perek, or Pirkah, from the same root, to denote a section or portion of scripture. It is also called al Mohaf, the volume, and all Kitab, the book, by way of eminence, which answers to the Biblia of the Greeks; and al Dhikr, the admio-
nition, which name is also given to the Pentateuch and Gospel.

The Koran is divided into 114 larger portions of very unequal length, which we call chapters, but the Arabians Sowar, in the singular Sura, a word rarely used on any other occasion, and properly signifying a row, order, or a regular series; as a course of bricks in building, or a rank of soldiers in an army; and is the name in use and import with the Sura, or Tora of the Jews, who also call the fifty three sections of the Pentateuch Sedarin, a word of the same signification.

These chapters are not in the manuscript copies distinguished by their numerical order, but by particular titles, which are taken sometimes from a particular matter treated of, or person mentioned therein; but usually from the first word of note, exactly in the same manner as the Jews have named their Sedarin; though the word from which some chapters are denominated be very far distant, towards the middle, or perhaps the end of the chapter; which seems ridiculous. But the occasion of this seems to have been, that the verse or passage wherein such word occurs, was, in point of time, revealed and committed to writing before the other verses of the same chapter which preceded it in order; and the title being given to the chapter before it was completed, or the passages re-

duced to their present order, the verse from whence such title was taken did not always happen to begin the chap-
ter. Some chapters have two or more titles, occasioned by the difference of the copies

Some of the chapters having been revealed at Mecca, and others at Medina, the noting this difference makes a part of the title: but the reader will observe that several of the chapters are said to have been revealed partly at Mecca, and partly at Medina; and, as to others, it is yet a dispute among the commentators to which place of the two they belong.

Every chapter is subdivided into smaller portions, of very unequal length also, which we commonly call verses; but the Arabic word is Ayat, the name with the Hebrew Osob, and signifies signs, or wonders; such as are the secrets of God, his attributef, works, judgments, and ordinances, delivered in those verses; many of which have their particular titles also, imposed in the same manner as those of the chapters.

Besides these unequal divisions of chapter and verse, the Mohammedans have also divided their Koran into sixty equal portions, which they call Abzab, in the singu-

lar Hizb, each subdivided into four equal parts; which is also an imitation of the Jews, who have an ancient di-

vision of their Mithma into sixty portions called Mafic-
toth: but the Koran is more usually divided into thirty sections only, named Ajza, from the singular Joz, each of twice the length of the former, and in the like manner subdivided into four parts. These divisions are for the ufe of the readers of the Koran in the royal temples, or in the adjoining chapels where the emperors and great men are interred. There are thirty of these readers belonging to every chapel, and each reads his section every day, so that the whole Koran is read over once a-day.

Next after the title, at the head of every chapter, except only the ninth, is prefixed the following solemn form, by the Mohammedans called the Bifmallah, In the name of the Most Merciful God; which form they constantly place at the beginning of all their books and writings in general, as a peculiar mark or distinguishing character of their religion, it being counted a sort of impiety to omit it. The Jews, for the same purpose, make use of the form, In the name of the Lord, or, In the name of the great God: and the eastern Christians that of, In the name of the Father, and of the Son, and of the Holy Ghost. But Mohammed probably took this form, as he did many other things, from the Persian Magi, who used to begin their books in these words, Benam Yazdan bakhshisgher dadar; that is, In the name of the most merciful just God.

There are twenty-nine chapters of the Koran, which have this peculiarity, that they begin with certain letters of the alphabet, some with a single one, others with more. These letters the Mohammedans believe to be the peculiar marks of the Koran, and to conceal several profound mysteries, the certain understanding of which, the more intelligent confess, has not been communicated to any mortal, their prophet only excepted. Notwithstanding which, some will take the liberty of guessing at their meaning by that species of Cabala called by the Jews Notari-

kon, and suppose the letters to stand for as many words, expelling
ordinances, and decrees; and therefore these mysterious letters, as well as the verses themselves, seem in the Koran to be called signs. Others explain the intent of these letters from their nature or organ, or else from their value in numbers, according to another species of the Jewish Cabala called Gematria; the uncertainty of which conjectures sufficiently appears from their disagreement. Thus, for example, five chapters, one of which is the second, begin with these letters, A L M. which some imagine to stand for, Allah latif magid; God is gracious and to be glorified; or, Ana li minni, to me and from me, viz. belongs all perfection, and proceeds all good; or else for Ana Allah alam, I am the most wise God, taking the first letter to mark the beginning of the first word, the second the middle of the second word, and the third the last of the third word; or for Allah, Gabriel, Mohammed, the author, revealer, and preacher of the Koran. Others say, that as the letter A belongs to the lower part of the throat, the first of the organs of speech; L to the palate, the middle organ; and M to the lips, which are the last organ; so these letters signify that God is the beginning, middle, and end, or ought to be praised in the beginning, middle, and end, of all our words and actions: or, as the total value of these three letters, in numbers, is seventy-one, they signify, that, in the space of so many years, the religion preached in the Koran should be fully established. The conjecture of a learned Christian is at least as certain as any of the former, who supposes these letters were set there by the amenunshis, for Amar li Mohammed, i.e. As the command of Mohammed, as the five letters prefixed to the nineteenth chapter seem to be there written by a Jewish scribe, for Cob yar, i.e. Thus be commanded.

The Koran is universally allowed to be written with the utmost elegance and purity of language, in the dialect of the tribe of Koreifh, the most noble and polite of all the Arabians, but with some mixture, though very rarely, of other dialects. It is confessedly the standard of the Arabic tongue, and, as the more orthodox believe, and are taught by the book itself, inimitable by any human pen, (though some sceptics have been of another opinion) and therefore infilled on as a permanent miracle, greater than that of raising the dead, and alone sufficient to convince the world of its divine original.

And to this miracle did Mohammed himself chiefly appeal for the confirmation of his mission, publicly challenging the most eloquent men in Arabia, which was at that time stocked with thoufands, whose sole study and ambition it was to excel in elegance of style and composition, to produce even a single chapter that might be compared with it.

The general design of the Koran seems to be this: to unite the professors of the three different religions then followed in the populous country of Arabia, who, for the most part, lived promiscuously, and wandered without guides, the far greater number being idolaters, and the rest Jews and Christians mostly of erroneous and heretick belief, in the knowledge and worship of one eternal, invisible God, by whose power all things were made, and those which are not may be; the supreme Governor, Judge, and absolute Lord of the creation; established under the sanction of certain laws, and the outward signs of certain ceremonies, partly of ancient, and partly of novel invention, and enforced by setting before them rewards and punishments, both temporal and eternal: and to bring them all to the obedience of Mohammed, as the prophet and ambassador of God, who, after the repeated admonitions, promises and threats of former ages, was at last to establish and propagate God's religion on earth by force of arms, and to be acknowledged chief pontiff in spiritual matters, as well as supreme prince in temporal.

The great doctrine then of the Koran is the unity of God; to restore which point Mohammed pretended was the chief end of his mission; it being laid down by him, as a fundamental truth, that there never was, nor ever can be, more than one true orthodox religion. For, though the particular laws or ceremonies are only temporary, and subject to alteration, according to the divine direction; yet, the substance of it, being eternal truth, is not liable to change, but continues immutable to the fame. And he taught, that, whenever this religion became neglected, or corrupted in essentials, God had the goodness to re-inform and re-admonish mankind thereof, by several prophets, of whom Moses and Jesus were the most distinguished, till the appearance of Mohammed, who is their heir, no other being to be expected after him. And the more effectually to engage people to hearken to him, the great part of the Koran is employed in relating examples of dreadful punishments formerly inflicted by God on those who rejected and abused his messengers; several of which stories, or some circumstances of them, are taken from the Old and New Testament, but many more from the apocryphal books and traditions of the Jews and Christians of those ages, set up in the Koran as truths in opposition to the scriptures, which the Jews and Christians are charged with having altered; and indeed few or none of the relations or circumstances in the Koran were invented by Mohammed, as is generally suppos'd, being easy to trace the greatest part of them much higher, as the rest might be, were more of those books extant, and it was worth while to make the inquiry.

The other part of the Koran is taken up in giving necessary laws and directions, in frequent admonitions to moral and divine virtues, and, above all, to the worshiping and reverencing of the only true God, and renunciation to his will; among which are many excellent things intermixed, not unworthy even a Christian's perusal.

But besides these, there are a great number of passages which are occasional, and relate to particular emergencies. For whenever any thing happened which perplexed and gravelled Mohammed, and which he could not otherwise get over, he had constant recourse to a new revelation, as an infallible expedient in all nice cases; and he found the success of this method answer his expectation. It was certainly an admirable and polite contrivance of his to bring down the whole Koran at once to the lowest heaven only, and not to the earth as a bungling prophet would probably have done; for if the whole had been published at once, innumerable objections might have been made, which it would have been very hard, if not impossible,
impossible, for him to solve: but as he pretended to have
received it by parcels, as God saw proper that they should
be published for the conversion and instruction of the people,
he had a sure way to answer all emergencies, and to
extricate himself with honour from any difficulty which
might occur.

That Mohammed was really the author and chief con-
troller of the Koran, is beyond dispute; though it be
highly probable that he had no small assistance in his de-
sign from others, as his countrymen failed not to object
to him; however, they differed so much in their conjectures
as to the particular persons who gave him such assistance,
that they were not able, it seems, to prove the charge;
Mohammed, it is to be presumed, having taken his mea-
sures too well to be discovered. Dr. Prideaux has given
the most probable account of this matter, though chiefly
from Christian writers, who generally mix such ridiculous
fables with what they deliver, that they deserve not
much credit.

However it be, the Mohammedans absolutely deny the
Koran was composed by their prophet himself, or any o-
ther for him; it being their general and orthodox belief
that it is of divine original, nay, that it is eternal and
unchanged, remaining, as some express it, in the very
effence of God: that the first transcript has been from
everlasting by God's throne, written on a tablet of va-
fonte, called the preserved table, in which are also re-
corded the divine decrees past and future: that a copy
from this table, in one volume on paper, was by the mi-
nistry of the angel Gabriel sent down to the lowest heaven,
in the month of Ramadan, on the night of power: from
whence Gabriel revealed it to Mohammed by parcels,
some at Mecca, and some at Medina, at different times,
during the space of twenty-three years, as the exigency
of affairs required: giving him, however, the confolu-
tion to shew him the whole (which they tell us was bound
in silk, and adorned with gold and precious stones of pa-
radise) once a year; but in the last year of his life he
had the favour to see it twice. They say that few chap-
ters were delivered entire, the most part being revealed
piece-meal, and written down from time to time by the
prophet's amanuenses in such or such a part of such or
such a chapter, till they were completed according to
the directions of the angel. The first parcel that was
revealed is generally agreed to have been the first five
verses of the ninety-first chapter.

After the new revealed passages had been from the
prophet's mouth taken down in writing by his scribe,
they were published to his followers, several of whom
took copies for their private use, but the far greater
number got them by heart. The originals, when re-
turned, were put promiscuously into a chest, observing
no order of time, for which reason it is uncertain when
many passages were revealed.

When Mohammed died, he left his revelations in the
same disorder, and not digested into the method, such as
it is which we now find them in. This was the work
of his successor Abu Beer, who, considering that a great
number of passages were committed to the memory of
Mohammed's followers, many of whom were slain in
their wars, ordered the whole to be collected, not only
from the palm-leaves and skins on which they had been
written, and which were kept between two boards or
covers, but also from the mouths of such as had gotten
them by heart. And this transcript, when completed,
he committed to the custody of Hafsa the daughter of
Omar, one of the prophet's widows.

From this relation it is generally imagined that Abu
Beer was really the compiler of the Koran; though, for
ought appears to the contrary, Mohammed left the chap-
ters complete as we now have them, excepting such pas-
sages as his successor might add or correct from those
who had gotten them by heart; what Abu Beer did else
being, perhaps, no more than to range the chapters in
their present order, which he seems to have done with
out any regard to time, having generally placed the long-
east first.

However, in the thirty-first year of the Hejra, Othman
being then Khalif, and observing the great disagreement
in the copies of the Koran in the several provinces of
the empire, those of Irak, for example, following the
reading of Abu Mufa al Afhari, and the Syrians that of
Madad Ebn Afsaw, he, by advice of the companions,
ordered a great number of copies to be transcribed from
that of Abu Beer, in Hafsa's care, under the inspection
of Zeid Ebn Thabet, Abd'allah Ebn Zobair, Said Ebn
al As, and Abd'rahman Ebn al Hareth the Mahkumite;
whom he directed, that, where-ever they disagreed about
any word, they should write it in the dialect of the Koreifi,
in which it was at first delivered. These copies, when
made, were dispersed in the several provinces of the em-
pire, and the old ones burnt and supplanted. Though
many things in Hafsa's copy were corrected by the above-
mentioned supervisors, yet some few various readings still
occur.

The fundamental position, on which Mohammed e-
rected the superstructure of his religion, was, That, from
the beginning to the end of the world, there has been,
and for ever will be, but one true orthodox belief; con-
stituting, as to matter of faith, in the acknowledging of
the only true God, and the believing in and obeying such
messengers or prophets as he should from time to time
send, with proper credentials, to reveal his will to man-
kind; and, as to matter of practice, in the observance
of the immutable and eternal laws of right and wrong,
together with such other precepts and ceremonies as God
should think fit to order for the time being, according to
the different dispensations in different ages of the world:
for these last, he allowed, were things indifferent in their
own nature; and became obligatory by God's positive
precept only; and were therefore temporary, and subject

to alteration, according to his will and pleasure. And
to this religion he gives the name of Islam, which word
signifies resignation, or submission to the service and
commands of God; and is used as the proper name of
the Mohammedan religion, which they will also have to be the
name at bottom with that of all the prophets from Adam.

Under pretext that this eternal religion was in his time
 corrupted, and professed in its purity by no one left of
men, Mohammed pretended to be a prophet sent by God,
to reform those abuses which had crept into it, and to
reduce it to its primitive simplicity; with the addition
however
however of peculiar laws and ceremonies, some of which had been used in former times, and others were now first instituted. And he comprehended the whole substance of his doctrine under these two propositions, or articles of faith, viz. that there is but one God, and that himself was the apostle of God; in consequence of which latter article, all such ordinances and institutions as he thought fit to establish must be received as obligatory and of divine authority.

The Mohammedans divide their religion, which they call Islam, into two distinct parts; Iman, i.e. faith, or theory; and Din, i.e. religion, or practice; and teach that it is built on five fundamental points, one belonging to faith, and the other four to practice.

The first is, that there is no god but the true God; and that Mohammed is his apostle. Under which they comprehend six distinct branches, viz. 1. Belief in God; 2. In his angels; 3. In his scriptures; 4. In his prophets; 5. In the resurrection and day of judgment; and, 6. In God’s absolute decree and predetermination both of good and evil.

The four points relating to practice are, 1. Prayer, under which are comprehended those washings or purifications which are necessary preparations required before prayer; 2. Alms; 3. Fasting; and, 4. The pilgrimage to Mecca.

That both Mohammed, and those among his followers who are reckoned orthodox, had and continue to have under which are comprehended those washings or purifications which are necessary preparations required before prayer; 2. Alms; 3. Fasting; and, 4. The pilgrimage to Mecca.

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That both Mohammed, and those among his followers who are reckoned orthodox, had and continue to have under which are comprehended those washings or purifications which are necessary preparations required before prayer; 2. Alms; 3. Fasting; and, 4. The pilgrimage to Mecca.
time to time sent by God into the world, amounts to no less than 224,000, according to one Mohammedan tradition, or to 124,000, according to another: among whom 318 were apostles, sent with special commissions to reclaim mankind from infidelity and superstitious; and fix of them brought new laws or dispensations, which successively abrogated the preceding: these were Adam, Noah, Abraham, Moses, Jesus, and Mohammed. All the prophets in general, the Mohammedans believe to have been free from great sins and errors of consequence, and professors of one and the same religion, that is, Islam, notwithstanding the different laws and institutions which they observed. They allow of degrees among them, and hold some of them to be more excellent and honourable than others. The first place they give to the revealers and establifhers of new dispensations, and the next to the apostles.

In this great number of prophets, they not only reckon divers patriarchs and persons named in scripture, but not recorded to have been prophets, (wherein the Jewish and Christian writers have sometimes led the way,) as Adam, Seth, Lot, Isaac, Nun, Joshua, &c. and introduce some of them under different names, as Enoch, Heber, and Jethro, who are called, in the Koran, Edris, Hud, and Shoaib; but several others whose very names do not appear in scripture (though they endeavour to find some persons there to fix them on) as, Saleh, Khedr, Dhul'keff, &c.

The next article of faith required by the Koran is the belief of a general resurrection and a future judgment.

When a corpse is laid in the grave, they say he is received by an angel, who gives him notice of the coming of the two Examiners; which are two black livid angels, received by an angel, who gives him notice of the coming of the two Examiners; which are two black livid angels, named Monker and Nakir. These order the dead person to fit upright, and examine him concerning his faith, as to the unity of God, and the Messiah of Mohammed: if he answer rightly, they suffer the body to rest in peace, and it is refrefhed by the air of paradise; but, if not, they beat him on the temples with iron maces, till he roars out for anguish so loud that he is heard by all from east to west, except men and genii. Then they prepare the earth for the corpse, which is gnawed and flung till the resurrection by ninety-nine dragons, with seven heads each; or, as others say, their fins will become venomous beasts, the grievous ones flinging like dragons, the smaller like serpents; circumstances which some understand in a figurative sense.

As to the soul, they hold, that, when it is separated from the body by the angel of death, who performs his office with care and gentleness towards the good, and with violence towards the wicked, it enters into that state which they call Al Berzakh, or the interval between death and the resurrection. If the departed person was a believer, they say two angels meet him, who convey it to heaven, that its place there may be assigned, according to its merit and degree. For they distinguish the souls of the faithful into three classes; the first of prophets, whose souls are admitted into paradise immediately; the second of martyrs, whose spirits, according to a tradition of Mohammed, rest in the crops of green birds, which eat of the fruits and drink of the rivers of paradise; and the third of other believers, concerning the fate of whose souls before the resurrection there are various opinions.

Though some among the Mohammedans have thought that the resurrection will be merely spiritual, and no more than the returning of the soul to the place whence it first came (an opinion defended by Ebn Sina, and called by some the opinion of the philosophers); and others, who allow man to confit of body only, that it will be merely corporeal; the received opinion is, that both body and soul will be raised; and their doctors argue strenuously for the possibility of the resurrection of the body, and dispute with great subtlety concerning the manner of it. But Mohammed has taken care to preserve one part of the body, whatever becomes of the rest, to serve for a basis of the future edifice, or rather a heaven for the mass which is to be joined to it. For he taught, that a man's body was entirely consumed by the earth, except only the bone called al Ajj, which we name the os coccygis, or rump bone; and that, as it was the first formed in the human body, it will also remain uncorrupted till the last day, as a seed from whence the whole is to be renewed: and this, he said, would be effected by a forty days rain, which God should send, and which would cover the earth to the height of twelve cubits, and cause the bodies to sprout forth like plants. Herein also, is Mohammed beholden to the Jews; who say the same things of the bone Luz, excepting that what he attributes to a great rain, will be effected, according to them, by a dew, impregnating the dust of the earth.

The time of the resurrection the Mohammedans allow to be a perfect secret to all but God alone; the angel Gabriel himself acknowledging his ignorance in this point, when Mohammed asked him about it. However, they say, the approach of that day may be known from certain signs which are to precede it. These signs they distinguish into two sorts, the lesser, and the greater.

The lesser signs are, 1. The decay of faith among men. 2. The advancing of the meanest persons to eminent dignity. 3. That a maid-servant shall become the mother of her mistress (or master;) by which is meant, either that towards the end of the world men shall be much given to sensuality, or that the Mohammedans shall then take many captives. 4. Rumors and seditions. 5. A war with the Turks. 6. Great disturbances in the world, so that a man when he paces by another's grave, shall say, Would to God I were in his place. 7. That the provinces of Irak and Syria shall refuse to pay their tribute. And, 8. That the buildings of Medina shall reach to Ahab, or Yahab.

The greater signs are,

1. The sun's rising in the west; which some have imagined it originally did.

2. The appearance of the beaft, which shall rise out of the earth, in the temple of Mecca, or on mount Safa, or in the territory of Tayef, or some other place. This beaft, they say, is to be sixty cubits high; though others, not satisfied with so small a size, will have her reach to the clouds and to heaven, when her head only is out; and that she will appear for three days, but shew only a third part of her body. They describe this monster, as
to her form, to be a compound of various species; having the head of a bull, the eyes of a hog, the ears of an elephant, the horns of a flag, the neck of an ostrich, the breast of a lion, the colour of a tiger, the back of a cat, the tail of a ram, the legs of a camel, and the voice of an ass. Some say this beast is to appear three times in several places, and that she will bring with her the rod of Moses and the seal of Solomon; and, being so swift that none can overtake or escape her, will with the first strike all the believers on the face, and mark them with the word mummum i.e. believer; and with the latter will mark the unbelievers on the face likewise, with the word Cather, i.e. infidel, that every person may be known for what he really is. They add that the same beast is to demonstrate the vanity of all religions except Islam, and to speak Arabic. All this stuff seems to be the result of a confused idea of the beast in the Revelations.

3. War with the Greeks, and the taking Constanti- nople by 70,000 of the pallerity of Isaac, who shall not win that city by force of arms, but the walls shall fall down while they cry out, There is no God but God: God is most great! As they are dividing the spoils, news will come to them of the appearance of Antichrist; whereupon they shall leave all and return back.

4. The coming of Antichrist, whom the Mohammedans call Masb al Daajal, i.e. the false or lying Christ, and simply al Daajal. He is to be one-eyed, and marked on the forehead with the letters C. F. R. signifying Caesar or infidel. They say that the Jews give him the name of Messiah Ben David, and pretend he is to come in the last days, and to be lord both of land and sea, and that he will reform the kingdom to them.

5. The descent of Jesus on earth. They pretend that he is to descend near the white tower to the east of Damascus, when the people are returned from the taking of Constantinople; that he is to embrace the Mohammedan religion, marry a wife, get children, kill Antichrist, and at length die after forty years, or, according to others, twenty four years continuance on earth. Under him, they say, there will be great security, and plenty in the world, all hatred and malice being laid aside; when lions and camels, bears and sheep, shall live in peace, and a child shall play with serpents unurt.

6. War with the Jews; of whom the Mohammedans are to make a prodigious slaughter. The very trees and stones discovering each of them as hide themselves, except only the tree called Gharkad, which is the tree of the Jews.

7. The eruption of Gog and Magog, or, as they are called in the east, Yajaj and Majaj; of whom many things are related in the Koran and the traditions of Mohammed. These barbarians, they tell us, having passed the lake of Tiberias, which the vanguard of their vast army will drink dry, will come to Jerusalem, and there greatly distress Jesus and his companions; till, at his request, God will destroy them, and fill the earth with their carcasses, which, after some time, God will send birds to carry away, at the prayers of Jesus and his followers. Their bows, arrows, and quivers, the Moslems will burn for seven years together; and, at last, God will send a rain to cleanse the earth, and to make it fertile.

8. A snowe, which shall fill the whole earth.

9. An eclipse of the moon. Mohammed is reported to have said, that there would be three eclipses before the last hour; one to be seen in the east, another in the west, and the third in Arabia.

10. The returning of the Arabs to the worship of Allat and al Uzza, and the rest of their ancient idols, after the decease of every one in whole heart there was faith equal to a grain of mustard seed, none but the very word of men being left alive. For God, they say, will send a cold odouriferous wind, blowing from Syria Damascus, which shall sweep away the souls of all the faithful, and the Koran itself, so that men will remain in the grossest ignorance for an hundred years.

11. The discovery of a vast heap of gold and silver by the retreating of the Ephrates, which will be the destruction of many.

12. The demolition of the Caaba, or temple of Mecca, by the Ethiopians.

13. The speaking of beasts and inanimate things.

14. The breaking out of fire in the province of Hejaz; or, according to others, in Yemen.

15. The appearance of a man of the descendants of Kahtan, who shall drive men before him with his staff.

16. The coming of the Muhdi, or director; concerning whom Mohammed prophesied, that the world should not have an end till one of his own family should govern the Arabsians, whose name should be the same with his own name, and whose father's name should also be the same with his father's name; and who should fill the earth with righteousness. This person the Shites believe to be now alive, and concealed in some secret place, till the time of his manifestation; for they suppose him no other than the last of the twelve Imams, named Mohammed Abul'Kafem, as their prophet was; and the son of Hasson al Askeri, the eleventh of that succession. He was born at German in the 255th year of the Hijra. From this tradition, it is to be presumed, an opinion pretty current among the Christians, took its rife, that the Mohammedans are in expectation of their prophet's return.

17. A wind which shall sweep away the souls of all who have but a grain of faith in their hearts, as has been mentioned under the tenth sign.

These are the greater signs, which, according to their doctrine, are to precede the resurrection, but still leave the hour of it uncertain; for the immediate sign of its being come will be the first blast of the trumpet; which they believe will be founded three times. The first they call the blast of confirmation: at the hearing of which all creatures in heaven and earth shall be struck with terror, except those whom God shall please to exempt from it. The effects attributed to this first sound of the trumpet are very wonderful; for they say, the earth will be shaken, and not only all buildings, but the very mountains levelled; that the heavens shall melt, the sun be darkened, the stars fall, on the death of the angels, who, as some imagine, hold them suspended between heaven and earth; and the sea shall be troubled and dried up, or, according to others, turned into flames, the sun, moon, and stars being thrown into it: the Koran, to express the greatness of the terror of that day, adds, that women who
give fock shall abandon the care of their infants, and even the fhe camels which have gone ten months with young (a moft valuable part of the fubftance of that nation) fhall be utterly neglefted. A farther effect of this blast will be that concourse of heafs mentioned in the Koran, though some doubt whether it be to precede the resurrection or not. They who fuppofe it will precede, think that all kinds of animals, forgetting their repective natural hierarchies and timidity, will run together into one place, being terrified by the found of the trumpet and the fudden shock of nature.

The Mohammedans believe that this firft blast will be followed by a fecond, which they call the blast of examination; when all creatures both in heaven and earth shall die or be affiode, except thofe which God fhall please to exempt from the common fate; and this, they fay, fhall happen in the twinkling of an eye, nay in an instant; nothing furviving except God alone, with paradise and hell, and the inhabitants of those two places, and the throne of glory. The laft who fhall die will be the angel of death.

Fifty years after this will be heard the blast of resurrection, when the trumpet fhall be sounded the third time by Ifrafil, who, together with Grabiel and Michael, will be previously reftored to life, and, standing on the rock of the temple of Jerusalem, fhall, at God's command, call together all the dry and rotten bones, and other difperfed parts of the bodies; and the very hairs, to judgment. This angel, having, by the divine order, fet the trumpet to his mouth, and called together all the fouls from all parts, will throw them into his trumpet, from whence, on his giving the laft sound, at the command of God, they will fly forth like bees, and fill the whole space between heaven and earth, and then repair to their repective bodies, which the opening earth willuffer to arife; and the firft who fhall fo arife, according to a tradition of Mohammed, will be himself. For this birth the earth will be prepared by the rain above mentioned, which is to fall continually for forty years and will reftemb the feed of a man, and be fuppiled from the water under the throne of God, which is called living water: by the efficacy and virtue of which the dead bodies fhall spring forth from their graves, as they did in their mother's womb, or as corn fprouts forfh by common rain, till they become perfect, after which breath will be breathed into them, and they will fleep in their sepulchres till they are raifed to life at the laft trump.

When thofe who have rifen fhall have waited the limited time, the Mohammedans believe God will at length appear to judge them; Mohammed undertaking the office of intercedor after it fhall have been declined by Adam, Noah, Abraham, and Jesus, who fhall beg deliverance only for their own fouls. They fay, that on this folemn occasion God will come in the clouds surrounded by angels, and will produce the books wherein the actions of every perfon are recorded by their guardian angels, and will command the prophets to bear witness againft thofe to whom they have been repectively fent. Then every one will be examined concerning all his words and actions, uttered and done by him in this life; not as if God needed any information in these repects, but to oblige the per-
perfon's good works fo much as equalleth the weight of the contrary, his good works be exhausted, and thereunto him, that he may be admitted into paradife; but if, an ant, God will, of his mercy, cause it to be doubled ven to every cne his due, and there remaineth of this suffered it. Which being done, if the angels (by whose away a proportional part of the good works of him who will be fent to hell laden with both. This will be the manner of giving this satisfadion will be by taking for the injuries which they have suffered. And, fince words and actions, being mere accidents, are not caable of being themselves weighed. They say that the books wherein they are written will be thrown into the scales, and according as those wherein the good or evil actions are recorded shall preponderate, sentence will be given; those whose balances laden with good works shall be heavy, will be faved; but those whose balances are light, will be condemned. Nor will any one have caufe to complain that God suffers any good action to pafs unrewarded, because the wicked for the good they do have their reward in this life, and therefore can expect no faour in the next.

This examination being pafs, and every one's works weighed in a just balance, that mutual retaliation will follow, according to which every creature will take vengeance one of another, or have satisfadion made them for the injuries which they have suffered. And, fince there will then be no other way of returning like for like, the manner of giving this satisfadion will be by taking away a proportional part of the good works of him who offered the injury, and adding it to thofe of him who fuffered it. Which being done, if the angels (by whose miniftry this is to be performed) fay, Lord, we have given to every one his due, and there remaineth of this person's good works so much as equalleth the weight of an ant, God will, of his mercy, caufe it to be doubled unto him, that he may be admitted into paradife; but if, on the contrary, his good works be exhausted, and there remain evil works only, and there be any who have not yet received satisfadion from him, God will order that an equal weight of their fins be added unto his, that he may be punifhed for them in their ftead, and he will be fent to hell laden with both. This will be the method of God's dealing with mankind. As to brutes, af ter they shall have likewise taken vengeance of one another, he will command them to be changed into duft; wicked men being referred to more grievous punishment, fo that they shall cry out, on hearing this sentence paffed on the brutes, Would to God that we were dust alfo. As to the genii, many Mohammedans are of opinion, that fuch of them as are true believers, will undergo the fame fate as the irrational animals, and have no other reward than the favour of being converted into duft; and for this they quote the authority of their prophet.

The trials being over, and the assemby difolved, the Mohammedans hold, that thofe who are to be admitted into paradife will take the right hand way, and thofe who are defined to hell fire will take the left; but both of them must firft pafs the bridge called in Arabic al Sirat, which they fay is laid over the midft of hell, and describe to be firmer than a hair, and sharper than the edge of a fword; fo that it feems very difficult to conceive how any one fhall be able to fland upon it: for which reafon, moft of the fect of the Motaz dites rejedt it as a fable; though the orthodox think it a fufficient proof of the truth of this article, that it was ferially afirmed by him who never afferted a fallaehood, meaning their prophet; who, to add to the difficulty of the paffage, has likewife declared, that this bridge is befet on each fide with briers and hooked thorns; which will however be no impediment to the good, for they fhall pafs with wonderful ease and f'=wiftnefs, like lightning, or the wind, Mohammed and his Mohifmens leading the way; whereas the wicked, what with the flipperinefs and extreme narrownefs of the path, the inte-
collection of Mohammed and the blessed; wherein those who shall have been dead, will be restored to life, as has been said; and those whose bodies shall have contracted any footnotes or filth from the flames and smoke of hell, will be immersed in one of the rivers of paradise, called the river of life, which will wash them whiter than pearls.

The righteous, as the Mohammedans are taught to believe, having surmounted the difficulties, and passed the sharp bridge above mentioned, before they enter paradise, will be refreshed by drinking at the pond of their prophet, who describes it to be an exact square of a month's journey in compass; its water, which is supplied by two pipes from al Cawthar, one of the rivers of paradise, being whiter than milk or silver, and more odoriferous than musk, with as many cups set around it as there are stars in the firmament; of which water whoever drinks will thirst no more for ever. This is the first taste which the blessed will have of their future and now near approaching felicity.

Though paradise be so very frequently mentioned in the Koran, yet it is a dispute among the Mohammedans whether it be already created, or be to be created hereafter; the Muzlamites and some other sectaries affirming that there is not at present any such place in nature, and that the paradise which the righteous will inhabit in the next life will be different from that from which Adam was expelled. However, the orthodox profess the contrary, maintaining that it was created even before the world, and describe it, from their prophet's traditions, in the following manner.

They say it is situate above the seventh heavens (or in the seventh heaven) and next under the throne of God; and, to express the amenity of the place, tell us, that the earth of it is of the finest wheat flour, or of the purest musk, or, as others will have it, of saffron: that its stones are pearls and jacinths, the walls of its buildings enriched with gold and silver, and that the trunks of all its trees are of gold: among which the most remarkable is the tree called Tuba, or the tree of happiness. Concerning this tree, they fable, that it stands in the palace of Mohammed, though a branch of it will reach to the house of every true believer; that it will be laden with pomegranates, grapes, dates, and other fruit, of surprising biggess, and of tastes unknown to mortals. So that, if a man desire to eat of any particular kind of fruit, it will immediately be presented him; or, if he chuse flesh, birds ready dressed will be set before him, according to his wish. They add, that the boughs of this tree will spontaneously bend down to the hand of the person who would gather of its fruits, and that it will supply the blessed not only with food, but also with fine garments, and beards to ride on ready saddled and bridled, and adorned with rich trappings, which will burst forth from its fruits; and that this tree is so large, that a person, mounted on the fleetest horse, would not be able to gallop from one end of its shade to the other in a hundred years.

As plenty of water is one of the greatest additions to the pleasures of any place, the Koran often speaks of the rivers of paradise as a principal ornament thereof: some of these rivers, they say, flow with water, some with milk, some with wine, and others with honey; all taking their rise from the root of the tree Tuba.

But all these glories will be eclipsed by the resplendent and ravishing girls of paradise, called, from their large black eyes, Hur al aman, the enjoyment of whole company will be a principal felicity of the faithful. These, they say, are created, not of clay, as mortal women are, but of pure musk; being, as their prophet often affirms in his Koran, tree from all natural impurities, defects, and inconveniences incident to the sex, of the strictest modesty, and secluded from public view in pavilions of hollow pearls, so large, that, as some traditions have it, one of them will be no less than four paragangs (or, as others say, sixty miles) long, and as many broad.

The name which the Mohammedans usually give to this happy mansion, is al Jannat, or the garden; and sometimes they call it, with an addition, Jannat al Ferdows, the garden of paradise; Jannat Eden, the garden of Eden, (though they generally interpret the word Eden, not according to its accent in Hebrew, but according to its meaning in their own tongue, where-in it signifies a settled or perpetual habitation:) Jannat al Mawwa, the garden of abode; Jannat al Naim, the garden of pleasures; and the like: by which several appellations, some understand so many different gardens, or at least places of different degrees of felicity, (for they reckon no less than an hundred such in all,) the very meanest whereof will afford its inhabitants so many pleasures and delights, that one would conclude they must even fink under them, had not Mohammed declared, that, in order to qualify the blessed for a full enjoyment of them, God will give to every one the abilities of an hundred men.

The sixth great point of faith, which the Mohammedans are taught by the Koran to believe, is God's absolute decree and predetermination both of good and evil. For the orthodox doctrine is, that whatever hath or shall come to pass in this world, whether it be good, or whether it be bad, proceedeth entirely from the divine will, and is irreconcilable fixed and recorded from all eternity in the preferved table; God having secretly predetermined not only the adverse and prosperous fortune of every person in this world, in the most minute particulars, but also his faith or infidelity, his obedience or disobedience, and consequently his everlasting happiness or misery after death; which fate or predetermination it is not possible, by any forethought or wisdom, to avoid.

Of this doctrine Mohammed makes great use in his Koran for the advancement of his designs; encouraging his followers to fight without fear, and even desperately, for the propagation of their faith, by representing to them that all their caution could not avert their inevitable destiny, or prolong their lives for a moment; and deterring them from disobeying or rejecting him as an impotent, by letting before them the danger they might thereby incur of being, by the just judgment of God, abandoned to destruction, hardships of heart, and a reprovable mind, as a punishment for their obstinacy.

Of the four fundamental points of religious practice required by the Koran, the first is prayer, under which are also comprehended those legal washings or purifications which are necessary preparations thereto.
Of these purifications there are two degrees, one called Ghofl, being a total immersion or bathing of the body in water; and the other called Wudu, (by the Persians, Abdej,) which is the washing of their faces, hands, and feet, after a certain manner. The Ghofl is required in some extraordinary cases only, as after having lain with a woman, or been polluted by emission of seed, or by approaching a dead body; women also being obliged to it after their courses or childbirth. The latter is the ordinary ablution in common cases, and before prayer, and must necessarily be used by every person before he can enter upon that duty. It is performed with certain formal ceremonies, which have been described by some writers, but much easier apprehended by seeing them done, than by the best description.

That his followers might be more punctual in this duty, Mohammed is said to have declared, that the practice of religion is founded on cleanliness, which is the one half of the faith, and the key of prayer, without which it will not be heard by God. That these expressions may be the better understood, Al Ghazali reckons four degrees of purification; of which the first is the cleaning of the body from all pollution, filth, and excrements; the second, the cleaning of the members of the body from all wickedness and unrighteous actions; the third, the cleaning the heart from all blameable inclinations and obnoxious vices; and the fourth, the purging a man's secret thoughts from all affections which may divert their attention on God: adding, that the body is but as the outward shell, in respect to the heart, which is as the kernel.

Circumcision, though it be not so much as once mentioned in the Koran, is yet held, by the Mohammedans, to be an ancient divine institution, confirmed by the religion of Islam; and, though not so absolutely necessary but that it may be dispensed with in some cases, yet highly proper and expedient. The Arabs used this rite for many ages before Mohammed, having probably learned it from the Hymarites and other tribes practiced the same. The Hymarites, we are told, used to circumcise their children, not on the eighth day, as is the custom of the Jews, but when about twelve or thirteen years old, at which age their father underwent that operation; and the Mohammedans imitate them so far as not to circumcise children before they be able at least distinctly to pronounce that profession of their faith. There is no God but God, Mohammed is the apostle of God; but pitch on what age they please for the purpose, between six or sixteen, or thereabouts.

Prayer was, by Mohammed, thought so necessary a duty, that he used to call it the pillar of religion, and the key of paradise; and when the Thakifites, who dwelt at Tayef, sending, in the ninth year of the Hejra, to make their submission to that prophet, after the keeping of their favourite idol had been denied them, begged, at last, that they might be dispensed with as to their paying of their appointed prayers, he answered, There is no God but God, Mohammed is the apostle of God; but pitch on what age they please for the purpose, between six or sixteen, or thereabouts.

That so important a duty, therefore, might not be neglected, Mohammed obliged his followers to pray five times every twenty-four hours, at certain fixed times; viz. 1. In the morning, before sun-rise: 2. When noon is past, and the sun begins to decline from the meridian: 3. In the afternoon, before sun-set: 4. In the evening, after sun-set, and before day be shut in: and, 5. After the day is shut in, and before the first watch of the night. For this institution he pretended to have received the divine command from the throne of God himself, when he took his night-journey to heaven; and the observance of the stated times of prayer is frequently insisted on in the Koran, though they be not particularly prescribed therein. Accordingly, at the aforesaid times, of which public notice is given by the Muedhdins, or Criers, from the steeple of their Mosques, (for they use no bells,) every conscientious Mohammetan prepares himself for prayer, which he performs either in the Mosque or any other place, provided it be clean, after a prescribed form, and with a certain number of praises or ejaculations, (which the more scrupulous count by a string of beads and using certain postures of worship;) all which have been particularly laid down and described, though with some few mistakes, by other writers, and ought not to be abridged, unless in some special cases, as on a journey, or preparing for battle, &c.

For the regular performance of the duty of prayer among the Mohammedans, besides the particulars above-mentioned, it is also requisite that they turn their faces, while they pray, towards the temple of Mecca; the quarter where the same is situate being, for that reason, pointed out within their mosques by a niche, which they call al Mehrab; and without, by the situation of the doors opening into the galleries of the steeple, there are also tables calculated for the ready finding out their Keblah, or direction.

The next point of the Mohammedan religion is the giving of alms; which are of two sorts, legal and voluntary. The legal alms are of indispensablenecessary, being commanded by the law, which directs and determines both the portion which is to be given, and of what things it ought to be given; but the voluntary alms are left to every one's liberty, to give more or less, as he shall see fit. The former kind of alms some think to be properly called Zacat, and the latter Sadakat; though this name be also frequently given to the legal alms. They are called Zecat, either because they increase a man's store by drawing down a blessing thereon, and produce in his soul the virtue of liberality; or because they purify the remaining part of one's sustenance from pollution, and the soul from the filth of avarice; and Sadakat, because they are a proof of a man's sincerity in the worship of God. Some writers have called the legal alms sithen, but improperly, since in some cases they fall short, and in others exceed that proportion.

The third point of religious practice is fasting; a duty of so great moment, that Mohammed used to say it was the gate of religion, and that the odour of the mouth of him who fasteth is more grateful to God than that of mufk; and al Ghazali reckons fasting one fourth part of the faith. According to the Mohammedan divines, there are three degrees of fasting: 1. The refraining the belly and other parts of the body from satisfying their lusts; 2. The refraining the ears, eyes, tongue, hands, feet, and other
ther, members from sin; and 3. The falling of the heart
from worldly cares, and restraining the thoughts from
very thing besides God.

The Mohammedans are obliged, by the express com-
mand of the Koran, to fast the whole month of Ramadan,
from the time the new moon first appears, till the ap-
pearance of the next new moon; during which time they
must abstain from eating, drinking, and women, from day-
break till night or sun-set. And this injunction they
observe so strictly, that, while they fast, they suffer no-
thing to enter their mouths, or other parts of their bo-
dy, esteeming the fast broken and null, if they smell per-
fumes, take a clyster or injection, bathe, or even pur-
ficipally swallow their spittle: some being so cautious,
that they will not open their mouths to speak, lest they should
breathe the air too freely; the fast is also deemed void,
if a man kisses or touches a woman, or if he vomit deigned-
ly. But after sun-set they are allowed to refresh them-
seflves, and to eat and drink, and enjoy the company of
their wives till day-break; though the more rigid begin
the fast again at midnight. This fast is extremely rigor-
ous and mortifying when the month of Ramadan happens
to fall in summer, (or, the Arabian year being lunar,
each month runs through all the different seasons in the
course of thirty-three years) the length and heat of the
days making the observance of it much more difficult and
uneasy than in winter.

The reason given why the month of Ramadan was pitch-
ed on for this purpose is, that on that month the Koran
was sent down from heaven. Some pretend that Abra-
ham, Moses, and Jesus, received their respective revelations
in the same month.

The pilgrimage to Mecca is so necessary a point of
practise, that, according to a tradition of Mohamned,
whose death without performing it may as well die a
Jew or a Christian; and the same is expressly command-
ed in the Koran.

The temple of Mecca stands in the midst of the city,
and is honoured with the title of Masjid al Haram, i.e.,
the sacred or inviolable temple. What is principally re-
verenced in this place, and gives sanctity to the whole,
is a square stone building, called the Caaba, as some fancy,
from its height, which surpasses that of the other build-
ings in Mecca; but more probably from its quadrangular
form, and Beit Allah, i.e. the house of God, being pe-
culiarly hallowed and set apart for his worship. The
length of this edifice, from north to south, is twenty-four
cubits, its breadth from east to west twenty-three cubits,
and its height twenty-seven cubits: the door, which is
on the east side, stands about four cubits from the ground;
the floor being level with the bottom of the door. In
the corner next this door is the black stone. On the
north side of the Caaba, within a semicircular inclosure
fifty cubits long, lies the white stone, said to be the fe-
pulchre of Ḫumāil, which receives the rain water that
falls off the Caaba by a spout, formerly of wood, but
now of gold. The Caaba has a double roof, supported
within by three octagonal pillars of aloes wood; between
which, on a bar of iron, hang some silver lamps. The
outside is covered with rich black damask, adorned with
an embrodered band of gold, which is changed every
year, and was formerly sent by the Khalifs, afterwards
by the Sultans of Egypt, and is now provided by the
Turkifh emperors. At a small distance from the Caaba,
on the east side, is the station or place of Abraham, where
is another stone much respected by the Mohammedans,
of which something will be said hereafter.

The Caaba, at some distance, is surrounded, but not
entirely, by a circular inclosure of pillars joined towards
the bottom by a low balustrade, and towards the top by
bars of silver. Juit without this inner inclosure, on the
south, north, and west sides of the Caaba, are three
buildings, which are the oratories or places where three
of the orthodox fefts assemble to perform their devotions,
(the fourth seat, viz. that of al Shafei, making use of
the station of Abraham for that purpose;) and, towards
the south-east, stands the edifice which covers the well
Zemzem, the treasury, and the cupola of al Abbas.

All these buildings are inclosed, at a considerable dis-
tance, by a magnificent piazza, or square colonnade, like
that of the Royal Exchange in London, but much larger,
covered with small domes or cupolas; from the four cor-
ners whereof rise as many minarets or spires, with
two galleries, and adorned with gilded spires and cre-
cents, as are the cupolas which cover the piazza and the
other buildings. Between the pillars of both inclosures
hang a great number of lamps, which are constantly light-
ed at night.

This is properly all that is called the temple; but, the
whole territory of Mecca being also Haram or sacred,
there is a third inclosure distinguished at certain distances
by small turrets, some five, some seven, and others ten
miles distant from the city. Within this compass of
ground it is not lawful to attack an enemy, or even to
hunt or fow, or cut a branch from a tree.

The temple of Mecca was a place of worship, and in
singular veneration with the Arabs, from great antiquity,
and many centuries before Mohammed. Though it was
most probably dedicated at first to an idolatrous use, yet
the Mohammedans are generally persuaded that the Caaba
is almost coeval with the world.

After this edifice had undergone several repafrations,
it was a few years after the birth of Mohammed rebuilt
by the Koreifs on the old foundation, and afterwards re-
paired by Abdallâh Ebn Zobeir, the Khalif of Mecca;
and at length again rebuilt by Yufufl, surnamed al Heja,
in the seventy-fourth year of the Hejra, with some alter-
ations, in the form wherein it now remains. Some
years after, however, the Khalif Harun al Râhid (or,
as others write, his father al Mohdi, or his grandfather
al Manfûr) intended again to change what had been al-
terred by al Heja, and to reduce the Caaba to the old
form in which it was left by Abd-âllâh; but was diff-
ued from meddling with it, let so holy a place should
become the sport of princes, and, being new-modelled af-
after every one’s fancy, should lose that reverence which
was justly paid it. But, notwithstanding the antiquity
and holiness of this building, they have a prophecy, by
tradition from Mohammed, that in the last times the
Ethiopians shall come and utterly demolish it; after
which it will not be rebuilt again for ever.

Before we leave the temple of Mecca, two or three
particulars deserve further notice. One is the celebrated *black stone*, which is set in silver, and fixed in the southwest corner of the Caaba, being that which looks toward Baira, about two cubits and one third, or, which is the same thing, seven spans from the ground. This stone is exceedingly respected by the Mohammedans, and is kissed by the pilgrims with great devotion, being called by some the *right hand of God on earth*. They believe that it is one of the precious stones of paradise, and fell down to the earth with Adam, and, being taken up again, or otherwise preferred at the deluge, the angel Gabriel afterwards brought it back to Abraham, when he was building the Caaba. It was at first whiter than milk, but afterwards black and shiny, by the touch of a menstruous woman, or, as others tell us, by the fins of mankind, or rather by the tongues and kisses of so many people; the surfaces only being black, and the inside still remaining white.

To this temple every Mohammedan, who has health and means sufficient, ought once, at least, in his life to go on pilgrimage; nor are women excused from the performance of this duty. The pilgrims meet at different places near Mecca, according to the different parts from whence they come, during the months of Shawal and Dhu'lkaada; being obliged to be there by the beginning of Dhu'lhajja; which month, as its name imports, is peculiarly set apart for the celebration of this solemnity.

At the place above-mentioned the pilgrims properly commence such; when the men put on the Ihram or sacred habit, which consists only of two woollen wrappers, one wrapped about their middle to cover their privities, and the other thrown over their shoulders, having their heads bare, and a kind of flippers which cover neither the heel nor the instep, and so enter the sacred territory in a slow and laborious manner, in imitation of Abraham, who, meeting the devil in that place, and being by him disturbed in his devotions, or tempted to disobedience, when he was going to sacrifice his son, was commanded by God to drive him away by throwing stones at him; though others pretend this rite is to be as old as Adam, who also put the devil to flight in the same place and by the same means.

This ceremony being over, on the same day, the tenth of Dhu'lhajja, the pilgrims slay their victims in the said valley of Mina; of which they and their friends eat part, and the rest is given to the poor. These victims must be either sheep, goats, kine, or camels; males, if of either of the two former kinds; and females, if of either of the latter; and of a fit age. The sacrifices being over, they shave their heads and cut their nails, burying them in the same place; after which the pilgrimage is looked upon as completed; though they again visit the Caaba, to take their leave of that sacred building.

**MAIDEN**, an instrument used in Scotland for beheading criminals.

This is a broad piece of iron, about a foot square, very sharp on the lower part, and loaded above with a very heavy weight of lead. At the time of execution it is pulled up to the top of a narrow wooden frame, about ten feet high, and as broad as the engine, with mouldings on each side for the maiden to stand on. A convenience is made about four feet from the ground, for the prisoner to lay his neck; and there is a kind of bar so fastened as to keep him from turning. The prisoner being thus secured, and the sign given, the maiden is let loose, which in a moment separates his head from his body.

**MAIDSTONE**, the county-town of Kent, situated on the Medway, twenty-two miles west of Canterbury; E. long. 57°, N. lat. 51° 36'. It sends two members to parliament.
MAJESTY, a title given to kings, which frequently serves as a term of distinction.

Thus the emperor is called Sacred Majesty, Imperial Majesty, and Caesarian Majesty; the king of France is called his Most Christian Majesty, and when he treats with the emperor, the word Sacred is added; and the king of Spain is termed his Most Catholic Majesty: with respect to other kings, the name of the kingdom is added, as his Britannic Majesty, his Polish Majesty, &c. Formerly princes were more sparing in giving titles, and more modest in claiming them: before the reign of Charles V. the kings of Spain had only the title of Highness; and before that of Henry VIII. the kings of England were only addressed under the title of Grace and Highness.

MAIL, or coat of Mail, a piece of defensive armour for the body, made of small iron rings, interwoven in the manner of a net.

Action of Mails and Duties, in Scots law. See Law, Tit. xxx. 20.

MAINE, a river of Germany, which rises on the east side of the circle of Franconia and running from east to west, discharges itself into the Rhine at Mentz.

MAINPRISE, in law, is the receiving a person into friendly custody, who might otherwise be committed to prison, on security given that he shall be forthcoming at a certain time and place appointed.

MAJOR, in the art of war, the name of several officers of very different ranks and functions; as 1. Major-general, the next officer to the lieutenant-general: his chief business is to receive the orders from the general, or in his absence from the lieutenant-general of the day: he is to distribute to the brigade-majors, with whom he is to regulate the guards, convoys, and detachments. When there are two attacks at a siege, he commands that one be approached. He ought to be well acquainted with the strength of each brigade: of each regiment in particular, and to have a list of all the field officers. In short, he is in the army what a major is in a regiment. He is allowed an aide-de-camp, and has a serjeant and fifteen men for his guard. 2. Major of a brigade, the officer who receives the orders from the major-general, and afterwards delivers them to the adjutants of the regiments at the head of the brigade: where he takes and marches the detachments, &c. to the general rendezvous. He ought to be an expert captain, to know the state and condition of the brigade, and keep a roll of the colonels, lieutenants-colonels, majors, and adjutants. 3. Major of a regiment; the next officer to the lieutenant-colonel, generally promoted from the oldest captain. He is to take care that the regiment be well exercised, to see it march in good order, and to rally it in case of its being broke. He is the only officer among the foot that is allowed to be on horseback in time of action, that he may the more readily execute the colonel's orders, either in advancing or drawing off the regiment. 4. Major of a regiment of horse, is the first captain, who commands in the absence of the colonel. 5. Town-major, the third officer in a garrison, being next to the deputy-governor. He ought to understand fortification, and hath charge of the guards, rounds, patrols, &c. His business is also to take care that the soldiers arms are in good order; he likewise orders the gates to be opened and shut, and gives the governor an account of all that passes within the place.

There are also aids major, drums major, &c. so called from their preeminence above others of the same denomination.

MAJOR, in logic, the first proposition of a syllogism. See Logic.

MAJORANA in botany See Origanum.

MAJORCA, the capital of a Spanish island of the same name: E. long. 2º 30', N. lat. 36º 30'.

This island is in the Mediterranean sea, about sixty miles long, and forty-five broad, situated about eighty miles south of the coast of Catalonia, and an hundred miles east of Valencia.

MAIRE or fireights of Le Maire, is a passage to Cape Horn, situated between Terra del Fuego in South America, and Staten island; which being discovered by Le Maire, obtained his name.

MAIZ. See Zea.

MALA, the cheek, in anatomy. See Anatomy, p. 160.

MALABAR, the south west coast of the peninsula of hither India, about 400 miles long, and 100 broad, bounded by Vizagapatam on the north, by the mountains of Baligate, on the east; and by the Indian ocean on the west and south.

MALACCA, the most southerly part of the further peninsula of India, about 600 miles long, and generally about 200 miles broad: bounded by Siam, on the north; by the bay of Siam and the Indian ocean, on the east; and by the fireights of Malacca, on the south-west. The capital of this country, which is also commonly called Malacca, is situated in 100º of E. long. and 2º 30' N. lat.

MALACHI, or the prophecy of Malachi, a canonical book of the old Testament, and the last of the twelve lesser prophets. Malachi prophesied about three hundred years before Christ, reproving the Jews for their wickedness after their return from Babylon, charging them with rebellion, sacrilege, adultery, prophaneness, and infidelity, and condemning the priests for being scandalously careless in their ministrations: at the same time not forgetting to encourage the pious few, who, in that corrupt age, maintained their integrity. This prophet distinctly points at the Messiah, who was suddenly to come to his temple, and to be introduced by Elijah the prophet that is, by John the Baptist, who came in the spirit and power of Elias or Elijah.

MALACIA, in medicine, is a languishing disorder incident to pregnant women, in which they long sometimes for one kind of food, and sometimes for another, and eat it with an extraordinary greediness.

MALACOPTERYGIOUS, among ichthyologists, an appellation given to such fishes as have the rays of their fins bony, but not pointed or sharp at the extremities, like those of acanthopterygious fishes.

MALACOSTOMOUS fishes, those destitute of teeth in the jaws, called in English leather-mouthed; as the tench, carp, bream, &c.
MALAGA, a city and port of Spain, in the province of Granada, situated in the Mediterranean, sixty-six miles north-east of Gibraltar; W. long. 4° 45', N. lat. 36° 40'.

MALAGMA, a cataplasm. See Cataplasm.

MALAMOCCA, a small island and port-town in the lagunes of Venice, situated five miles south of that city.

MALDIVA-ISLANDS, are about a thousand small islands in the Indian ocean, 500 miles south-west of the continent of the hither India, extending from the second degree of south latitude, to the seventh degree of north latitude.

MALDON, a port-town of Essex, ten miles east of Chelmsford. It sends two members to parliament.

MALE, among zoologists, that sex of animals which has the parts of generation without the body.

MALIGNANT, among physicians, a term applied to diseases of a very dangerous nature, and generally infectious: such are the dysentery, hospital-fever, &c. in their worst forms.

MALL, or Sea-mall, in ornithology. See Larus.

MALLEABLE, a property of metals, whereby they are capable of being extended under the hammer.

MALLEUS, in anatomy. See Anatomy, p. 297.

MALPO, or Saint Malo, a city and port-town of France, in the province of Britany, situated on a rock, in the English channel, but joined to the continent by a caufeway: W. long. 2°, N. lat. 48° 40'.

MALPO, in botany, a genus of the monadelphia polyandria class. The calix is double, the exterior one having three leaves; and the capsule contains but one seed. There is only one species, a native of Mauritania.

MALPIGIA, in botany, a genus of the decandria class. The calyx consists of five leaves, and the corolla of five roundish petals; and the berry has one cell and three seeds. There are nine species, none of them natives of Britain.

MALPLAQUET, a village in the Austrian Netherlands, in the province of Hainault, about seven miles from Mons.

MALT. See Brewing.

MALTA, the capital of a small island of the same name in the Mediterranean, is situated in E. long. 15°, N. lat. 35° 15'; consisting of three towns, separated by channels, which form so many peninsulas of solid rock, rising a great height above the sea.

Knights of Malta, otherwise called Hospitallers of St. John of Jerusalem, a religious military order, whose residence is in the island of Malta. The order consists of three classes, the knights, chaplains, and servants at arms; there are also priests who officiate in the churches; friar-fervants, who assist at the offices; and donnes, or clerics; but these are not reckoned constituent parts of the body. The government of the order is mixed, being partly monarchical, and partly aristocratical: the grand master is sovereign. The knights formerly consisted of eight different languages, but now only seven, the English having withdrawn themselves. None are admitted into this order but such as are of noble birth: the knights are of two sorts, those who have a right to be candidates for the dignity of grand master, called grand croissants, and those who are only knights assistants: they never marry, yet have continued from 1090 to the present time. The knights are received into this order, either by undergoing the trials prescribed by statutes, or by dispensation.

MALTON, a borough of Yorkshire, situated on the river Derwent, twenty miles north-east of York. It sends two members to parliament.

MALVA, in botany, a genus of the monadelphia polyandria class. The calix is double, the exterior one consisting of three leaves; and there are many capsules, containing each one seed. There are 22 species, five of them natives of Britain, viz. the sylvestris, or common mallow; the rotundifolia, or dwarf mallow; the parviflora, or small flowered mallow; the alcea, or vervain mallow; and the mosehata, or jagged-leaved vervain mallow. The leaves of the mallow are emollient.

MALUS, in botany. See Pyrus.

MAMALUKES, the name of a dynasty that reigned in Egypt.

The Mamalukes were originally Turkish and Circassian slaves, bought of the Tartars by Melicfaleh, to the number of a thousand, whom he bred up to arms, and raised some to the principal offices of the empire. They killed sultan Moodam, to whom they succeeded.

Others say, that the mamalukes were ordinarily chosen from among the Christian slaves, and that they were the same thing in a great measure with the Janissaries among the Turks. They never married. They first are said to have been brought from Circassia, and some have supposed that they began to reign about the year 869.

MAMMAE, in anatomy. See Anatomy, p. 277.

MAMMEA, in botany, a genus of the polyandria gynia class. The corolla consists of four petals, and the calyx of two leaves; and the berry is large, and contains four seeds. There are two species, none of them natives of Britain.

MAN, in zoology. See Homo.

MANCHESER, a large town of Lancashire, forty miles south-east of Lancaster.

MANDAMUS, in law, a writ that issues out of the court of king's bench, sent to a corporation, commanding them to admit or restore a person to his office.

MANDARINS, a name given to the magistrates and governors of provinces in China, who are chosen out of the most learned men, and whose government is always at a great distance from the place of their birth. Mandarin is also a name given by the Chinese to the learned language of the country; for besides the language peculiar to every province, there is one common to all the learned in the empire, which is in China what Latin is in Europe; this is called the mandarin tongue, or the language of the court.

MANDATE, in law, a judicial commandment to do something. See Mandamus.

MANDATE, in Scots law. See Law, Tit. xxii. 9.

MAN-
MANDERSCHEIT, a city of Germany, in the electorate of Trier, and the capital of the county of Manderheite: E. long. 6° 32', N. lat. 40° 20'.
MANDRAGORA, in botany. See ATropa.
MANE, the hair hanging down from a horse's neck; which should be long, thin, and fine; and if frizzled, so much the better.
MANEGE, or Manage, the exercise of riding the great horse, or the ground set apart for that purpose; which is sometimes covered, for continuing the exercise in bad weather; and sometimes open, in order to give more liberty and freedom both to the horseman and horse. See Horsemanship.
MANES, in the pagan system of theology, a general name of the deceased in matters of importance: this was called Necromancy. See Necromancy.
MANIFESTO, a public declaration made by a prince in writing, shewing his intentions to begin a war, or other enterprize, with the motives that induce him to it, and the reasons on which he founds his rights and pretensions.
MANILLE, in commerce, a large brass-ring in the form of a bracelet, either plain or engraved, flat or round. Manilles are the principal commodities which the Europeans carry to the coast of Africa, and exchange with the natives for slaves. Th ese people wear them as ornaments on the small of the leg, and on the thick part of the arm above the elbow. The great men wear manilles of gold and silver, but these are made in the country by the natives themselves.
MANIPULUS, in Roman antiquity, a body of infantry, consisting of two hundred men, and constituting the third part of a cohort.
MANIS, the scaly lizard, in zoology, a genus of quadrupeds, belonging to the order of Bruta, the characters of which are these: They have no fore-teeth either in the upper or under jaw; the tongue is long and cylindrical; the snout is long and narrow; and the body is covered with hard scales. There are two species, viz.
1. The pentadactyla, or scaly lizard with five toes on each foot. The head is smaller than the neck; the eyes are very small; the length of the body, including the tail, is from six to eight feet. The whole body is covered with hard scales, excepting the under part of the head and neck, the breast, the belly, and the internal side of each leg. Betwixt the scales of this animal, there are some hard hairs like the bristles of a hog, brownish at the points. The scales are of a reddish colour, very hard, convex above, and concave below. All the parts which want scales are naked. The scales are unconnected, and the animal can raise or lower them at pleasure like the quills of the porcupine. When irritated, he erects his scales, and rolls himself up like a hedge-hog. In this situation, neither the tiger, the lion, nor any other animal, is able to hurt him. This creature has nothing forbidding about him but his figure. He is mild and inoffensive, feeding on nothing but worms and other insects. His motion is slow; and he has no other method of escaping the pursuit of man, but by concealing himself in crannies of rocks, and in holes which they dig in the ground, where they likewise bring forth their young. This animal is a native of the East Indies; and are so few in number, that they are seldom to be met with.
2. The tetradactyla, or scaly lizard with four toes on each foot. This species is very similar to the former; only the tail is much longer in proportion to the body, and each part as want scales, instead of being naked, are covered with a soft hair. It is likewise found in the East Indies. See Plate CIV. fig. 4.
MANNA, in the materia medica, the concreted juice of some vegetable, naturally exuding from it, soluble in water, and not inflammable. It is a honey-like juice, brought to us from Calabria and
MANTLE, or Mantle tree, in architecture, the manufacturer, one who works up a natural product into an artificial commodity.

MANTLE, in heraldry, that appearance which is laid across the jamb, and surrounds the lower part of the chimney, or that piece of timber or military habit, worn by the ancient cavaliers over their armour to preserve it from rust; or, as others supposed originally to be the representation of a mantle, which is laid across the jamb, and surrounds the lower part of the chimney piece.

MANOR, an ancient royalty or lordship, formerly called a barony, confiding of demesnes, services, and a court-baron; and comprehending in it meffuages, lands, meadow, pithure, wood, rents, an advowfon, &c. It may contain one or more villages or hamlets, or only a great part of a village. &c.

MANS, the capital of the territory of Maine, in the province of Orleanois in France: E. long. 5°, N. lat. 48° 6'.

MANSFIELD, a city of Germany, the capital of a county of the same name, in the circle of Upper Saxony: E. long. 11° 45', N. lat. 51° 36'.

MANSION, in law, is the chief dwelling house of a lord within his fee, or the capital meffuage or manor-houle.

MANSLAUGHTER, generally termed homicide, is killing a person without premeditated malice.

MANTELETS, in the art of war, a kind of moveable forts, some with red veins, others with white, black, or brown veins. 14. The gray spotted marbles are variegated, some are veined with blue, and others with black, and others with green spots. 14. The red variegated marble is the brocatello of the Italians, with white and gold veins.

MAP, a plain figure, representing the surface of the earth, or a part thereof, according to the laws of perspective. See Geography.

MAPLE, in botany. See Acer.

MAPPARIUS, in Roman antiquity, the officer who received from the emperor or other magistrate.

MARANFA, in botany, a genus of the monandria monogynia class. The corolla is ringent, and consists of five segments. There are two species, none of them natives of Britain.

MARASMUS, among physicians, denotes an atrophy or consumption, in its last and most deplorable stage.

MARBLE, in natural history, a genus of shells; being bright and beautiful stones composed of small separate concretions, moderately hard, not giving fire with steel, fermenting with and soluble in acid muriatra, and calcining in a light fire.

The colours of marbles being a very obvious and striking character, they are arranged according to them in the following divisions. 1. Of the white plain marbles there are two sorts; the Parian marble of the ancients, and flatuary marble of the moderns, an extremely bright and elegant marble; and the Carara marble, a very fine marble, more compact and close than the former, but less bright. 2. Of the plain yellowish marbles there is only one sort, which is a hard, pale yellow, and glossy marble, found in many parts of Italy. 3. Of the bluish and black marbles there are a great many species, as the Chinese marble, basiliths, &c. 4. Of the light green marbles there is only one kind the Lacedemonian marble of the ancients. 5. The pale coloured or whitish brown, commonly called Derby-marble. 6. The green marbles with shells. 7. The black coralloide marble, with and without shells. 8. Of the white variegated marbles there are a great many species, variegated with purple, brown, red, blue, &c. 9. Of the brown variegated marbles there are likewise several sorts, some with red veins, others with white, black, or brown veins. 10. Of the yellow-veined and variegated marbles, some are veined with purple, and others with blue. 11. Of the black variegated marbles, some are veined with white, and others with blue, yellow, red &c. 12. The green variegated marbles are likewise distinguished by the colour of their veins. 13. The gray spotted marbles are variegated, some with black, and others with green spots. 14. The red variegated marble is the brocatello of the Italians, with white and gold veins.

Colouring of Marble. The colouring of marbles is a nice art; and in order to succeed in it, the pieces of marble on which the experiments are tried must be well polished, and clear from the leaf spot or vein. The harder the marble is, the better it will bear the heat necessary in the operation; therefore alabaster,
and the common soft white marble, are very improper to perform these operations upon.

Heat is always necessary for the opening the pores of the marble, so as to render it fit to receive the colours: but it must never be made red hot; for then the texture of the marble itself is injured, and the colours are burnt, and lose their beauty. Too small a degree of heat is as bad as too great; for, in this case, tho' the marble receive the colour, it will not be fixed in it, nor strike deep enough. Some colours will strike, even cold; but they are never so well funk in as when a just degree of heat is used. The proper degree is that which, without making the marble red, will make the liquor boil upon its surface. The menuliurns used to strike in the colours must be varied according to the nature of the colour to be used. A lixivium made with horse's or dog's urine, with four parts quick lime, and one part potato, is excellent for some colours; common lye of wood-ashes does very well for others: for some, spirit of wine is best; and finally, for others, oily liquors, or common white wine.

The colours which have been found to succeed best with the peculiar menuliurns, are these: stone blue dissolved in six times the quantity of spirit of wine, or of the urinous lixivium; and that colour which the painters call Prunus, dissolved in common lye of wood-ashes. An extract of saffron, and that colour made of wood-ashes, are burnt, and lose their beauty. Too small a degree of heat is as bad as too great; for, in this case, the marble is not struck deeply enough. Some colours will strike, even cold; but they are never so well sunk in as when a just degree of heat is used. The proper degree is that which, without making the marble red, will make the liquor boil upon its surface. The menuliurns used to strike in the colours must be varied according to the nature of the colour to be used. A lixivium made with horse's or dog's urine, with four parts quick lime, and one part potato, is excellent for some colours; common lye of wood-ashes does very well for others: for some, spirit of wine is best; and finally, for others, oily liquors, or common white wine.

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per, by dipping it on the flat, as also linen cloth, &c.

Marbling a book on the covers is performed by forming clouds with aqua fortis, or spirit of vitriol mixed with ink, and afterwards glazing the covers.

**MARCASITES**, in natural history, are defined to be compound inflammable metallic bodies, of a hard and solid substance, of an obscurely and irregularly foliaceous structure, of a bright glittering appearance, naturally constituting whole strata, though sometimes found in detached masses; very freely giving fire with steel; not fermenting with acid menstruums; and when put into the fire, yielding a blue sulphureous flame, and afterwards calcining into a purple powder. There are only three known species of this genus: 1. The silver-coloured marcasite, found in vast abundance in lead and tin mines. 2. The gold coloured marcasite. 3. The heavy pale-white marcasite.

Marcasites were at first supposed to be almost all pure gold or silver, according to their colour; but experience has shown, that if they contain any metal at all, no method has hitherto been found of working them to advantage. In Germany, indeed, they extract sulphur and vitriol from the silver marcasite, which two substances are always contained in it; and besides these, it has usually a quantity of arsenic. It has been recommended as a flyptic, after being calcined: but as the arsenic may not be all carried off by that operation, its use as a medicine seems extremely dangerous.

**MARCGRAVE**, or Magrave, a degree of honour in Germany answering to our marquis.

**MARCGRAVIA**, in botany, a genus of the polyandria class. The corolla consists of one petal, and the calyx consists of six imbricated leaves; and the berry has one cell, containing many seeds. There is but one species, a native of America.

**MARCH**, in chronology, the third month of the year, consisting of thirty-one days.

**MARCHANTIA**, in botany, a genus of the cryptogamia class. The corolla consists of one petal, and the calyx consists of six imbricated leaves; and the berry has one cell, containing many seeds. There are eight species, four of them natives of Britain, viz. the polymorpha, or common marchantia; the cruciata, or cross-headed marchantia; the hemispharica, or marib marchantia; and the conica, or wart marchantia.

**MARCHE**, a territory of Lyonois, in France, having Berry on the north, Burbonois and Auvergne on the east, Limousin on the south, and Poitou on the west.

**MARCHBURG**, a town of Germany, in the circle of Austria and duchy of Storia: W. long. 15° 50', N. lat. 47°.

**MARCIONITES**, Christian heretics in the IIth century, thus denominated from their leader Marcion, who maintained, that there were two principles or gods, a good and a bad one.

**MARCOSIANS**, a sect of Christian heretics in the IIth century, so called from their leader Marcus, who represented the supreme God as consisting not of a trini-
those who have done signal service to the commonwealth.

MARK, or MAR, also denotes a weight used in several states of Europe, and for several commodities, especially gold and silver. In France, the mark is divided into 8 ounces, or 64 drachms, or 192 dimes, or 240 mauls, or 620 felins, or 4628 grains. In Holland, the mark-weight is also called roge weight, and is equal to that of France. When gold and silver are sold by the mark, it is divided into 25 carats.

MARK is also used among us for a money of account, and in some other countries for a coin.

The English mark is two thirds of a poundsterling, or 12 st. 4d. and the Scotch mark is of equal value in Scotch money of account.

MARKET, a public place in a city or town, in which live cattle, provisions, or other goods, are set to sale; and also a privilege, either by grant or prescription, by which a town is enabled to keep a market.

MARLBRO', or MARLBOROUGH, a borough town of Wiltshire, eighteen miles north of Salisbury. It sends two members to parliament.

MARLBOROUGH-FOXT, an English factory on the west coast of the island of Sumatra, three miles east of Bencoolen: E. long. 101°, and S. lat. 4° 15'.

MARLE. See Agriculture, p. 48.

MARLOW, a borough town of Buckinghamshire, fifteen miles south of Aylesbury. It sends two members to parliament.

MARMALADE, a confedtion of plumbs, apricots, quinces, &c. boiled with sugar to a consistence.

MARMATE. See Marble.

MARMAR. See Marble.

MARMORA, a little island of Turkey, situated in the sea of Marmora, to which it gives name, lying sixty miles south-west of Constantinople.

MAROTTE, in zoology. See Mus.

MARSCH, or MARRIAGE, a great river, which, rising in the Carpathian mountains, runs through Transylvania and Hungary, and falls into the river Teyse at Segedin.

MARPOURG, a city of Germany, forty miles north of Frankfurt: E. long. 8° 40', and N. lat. 50° 40'.

MARQUE, or letters of MARQUE, in military affairs, are letters of reprisal, granting the subjects of one prince or state liberty to make reprisals on those of another.

Letters of marque among us are extraordinary commissions granted by authority for repossession, taken and disposed of by strangers at sea; and reprisals is only the retaking, or taking of one thing for another.

MARQUETRY, or INLAID-WORK, is a curious work composed of several fine hard pieces of wood, of various colours, fastened in thin slices on a ground, and sometimes enriched with other matters, as silver, bras, tortoise-shell, and ivory: with these affinities the art is now capable of imitating any thing; whence it is by some called the art of painting in wood.

MARQUIS, a title of honour, next in dignity to that of duke, first given to those who commanded the marches, that is, the borders and frontiers of countries.

MARR, that part of Aberdeenshire situated between the rivers Dee and Don.

MARRIAGE, a contract both civil and religious, between a man and a woman, by which they engage to live together in mutual love and friendship, for the ends of procreation, &c. See Law, Tit. vi.

The Romans, as well as the Greeks, disallowed of polygamy. A Roman might not marry any woman who was not a Roman. It was thought dishonourable for a woman to marry twice.

We find but few laws in the books of Moses concerning the institution of marriage: he restrained the Israelites from marrying within certain degrees of consanguinity; but we find, that polygamy, though not expressly allowed, is, however tacitly implied in the laws of Moses: there is a particular law that obliged a man, whose brother died without issue, to marry his widow, and raise up children to his brother. The Hebrews purchased their wives, by paying down a competent dowry for them; and a man was at liberty to marry, not only in any of the twelve tribes, but even out of them, provided it was with such nations as used circumcision.

The ancient Christian church laid several restraints upon her members in relation to marriage: such was the rule forbidding Christians to marry with infidels and heathens: another restraint related to the consanguinity and affinity prohibited in Scripture: a third was, that children under age should not marry without the consent of their parents, guardians, or next relations: and another was, that there should be some parity of condition between the contracting parties. They not only condemned polygamy, but even reckoned it unlawful to marry after a divorce. The Romish church requires of the clergy perpetual abstinence from marriage; and has advanced this institution to the dignity of a sacrament.

MARROW, in anatomy, a soft oelaginous substance contained in the cavity of the bones. See Anatomy, p. 147.

MARRUBIUM, in botany, a genus of the didynamia gymnosperma class. The calyx is rigid, with ten stamens; and the upper lip of the corolla is bifid, linear, and erect. There are nine species, only one of them, viz. the vulgare, or white horehound, is a native of Britain.

MARS, in astronomy. See Astronomy, p. 441.

MARS, among chemists, denotes iron, as being supposed to be under the influence of that planet. See Chemistry, p. 82 and 133.

MARSEILLES, a city and port of Provence, situated on a fine bay of the Mediterranean, twenty-five miles north-west of Toulon: E. long. 5° 20', N. lat. 43° 15'.

MARSIAL, in its primary significations, means an officer who has the command or care of horses; but it is now applied to officers who have various different employments, as earl marshal, knight marshal, or marshal of the king's horse, &c.

MARSIAL of the king's bench, an officer who has the custody of the king's-bench-prison in Southwark. This officer is obliged to give his attendance, and to take
take into his custody all persons committed by that court.

**Marshal of the exchequer**, an officer to whom that court commits the king's debts.

**Marshal of the king's hall**, an officer who has the care of placing the household servants and strangers at table, according to their quality.

**Marshal, or Mareschal**, of France, an officer of the greatest dignity in the French armies. When two or more marshals are in the army, the eldest commands.

**Marshall's coat**, in heraldry, is the disposition of several coats of arms belonging to distinct families, in one and the same escutcheon or shield, together with their ornaments, parts, and appurtenances.

**Marshfield**, a market-town of Wiltshire, thirty miles north-west of Salisbury.

**Marshmallow**, in botany. See *Althaea*.

**Marsilea**, in botany, a genus of the cryptogamia class. The antherae are four, and placed on an obtuse conic body: the fruit is of a roundish figure, consisting of four cells, in each of which are contained several roundish seeds. There are two species, none of them natives of Britain.

**St Martha**, a city and port-town of Terra Firma, in South America, and the capital of the province of St Martha: W. long. 74° 30', N. lat. 11° 45'.

**Martial law**, is the law of war, which entirely depends on the arbitrary power of the prince, or of those to whom he has delegated it. For though the king can make no laws in time of peace without the consent of parliament, yet in time of war he uses an absolute power over the army.

**Martin**, in zoology. See *Mustela*.

**Cape Martin**, a promontory of Valencia, in Spain, on the Mediterranean; it is under the meridian of London: N. lat. 28° 50'.

**Martingale**, in the manege, a thong of leather, fastened to one end of the girths under the belly of a horse, and at the other end to the muis roll, to keep him from rearing.

**Martinico**, the chief of the French Caribbee-islands, situated in 61° of west long. and between 14° and 5° N lat. It is sixty miles long, but is scarce twenty broad in any part.

**Martylets**, in heraldry, little birds represented without feet, and used as a difference or mark of distinction for younger brothers, to put them in mind that they are to truant to the wings of virtue and merit, in order to raise themselves, and not their feet, they having little land to set their foot on. See Plate CX fig. 2.

**Martynia**, in botany, a genus of the didynamia angiopermia class. The calyx consists of five segments; the corolla is ringent; and the capsule is woody, with a hooked beak, two valves, and three cells. There are two species, both natives of America.

**Martyr**, is one who lays down his life for the sake of his religion.

**Martyrology**, is a catalogue or list of martyrs, including the history of their lives and sufferings for the sake of religion.

The martyrologies draw their materials from the calendars of particular churches, in which the several festivals dedicated to them are marked; and which seem to be derived from the practice of the ancient Romans, who inscribed the names of heroes and great men in their faith, or public registers.

The martyrologies are very numerous, and contain many ridiculous and even contradictory narratives; which is easily accounted for, if we consider how many forged and spurious accounts of the lives of saints and martyrs appeared in the first ages of the church, which the legendary writers afterwards adopted without examining into the truth of them. However, some good critics, of late years, have gone a great way towards clearing the lives of the saints and martyrs from the monstrous heap of fiction they laboured under.

**Marvel of Peru**, in botany. See *Mirabilis*.

**Marygold**, See *Caltha*.

**Corn Marygold**, See *Chrysanthemum*.

**French Marygold**, in botany. See *Tagetes*.

**Maryland**, one of the British plantations in North America, situated between 74° and 78° W long. and between 38° and 40° N lat.

**Masculine**, or *Masculine gender*. Among grammarians, that belonging to the male. See *Grammar*.

**Masham**, a market town of Yorkshire, situated twenty-four miles north-west of the city of York.

**Mask**. See *Masque*.

**Mason**, a person employed, under the direction of an architect, in raising of a stone-building.

**Free and accepted Masons**, a very ancient society or body of men, so called, either from some extraordinary knowledge of masonry or building, which they are supposed to be masters of, or because the first founders of the society were persons of that profession. These are now very considerable, both for number and character, being found in every country in Europe, and consisting principally of persons of merit and consideration. As to antiquity, they lay claim to a standing of some thousand years. What the end of their institution is, seems still in some measure a secret; and they are said to be admitted into the fraternity by being put in possession of a great number of secrets, called the mason's word, which have been religiously kept from age to age. Being never divulged.

**Masonry**, in general, a branch of architecture, consisting in the art of hewing or squaring stones, and cutting them level or perpendicular, for the uses of building: but, in a more limited sense, masonry is the art of assembling and joining stones together with mortar. See *Architecture*.

**Mass**, in the church of Rome, the office or prayers used at the celebration of the eucharist; or, in other words, consecrating the bread and wine into the body and blood of Christ, and offering them, to transubstantiate, as an expiatory sacrifice for the quick and the dead. As the mass is in general believed to be a representation of the passion of our blessed Saviour, so every
every action of the priest, and every particular part of the service, is supposed to allude to the particular circumstances of his passion and death.

The general division of masses consists in high and low. The first is that sung by the choristers, and celebrated with the assistance of a deacon and sub-deacon: low masses are those in which the prayers are barely rehearsed without singing.

There are a great number of different or occasional masses in the Romish church, many of which have nothing peculiar but the name: such are the masses of the saints; that of St Mary of the Snow, celebrated on the fifth of August; that of St Margaret, patronesses of lying-in women; that of the feast of St John the Baptist, at which are said three masses; that of the Innocents, at which the glory in excelsis and the hallelujah are omitted, and it being a day of mourning the altar is of a violet colour. As to ordinary masses, some are said for the dead, and, it is supposed, contribute to fetch the soul out of purgatory. At these masses the altar is put in mourning, and the only decorations are a cross in the midst of six yellow wax-lights: the dresses of the celebrant and the very mass-book are black: many parts of the office are omitted, and the people are dismissed without the benediction.

If the masses be said for a person distinguished by his rank or virtues, it is followed with a funeral oration: they erect a chapel ardente, that is, a representation of the deceased, with branches and tapers of yellow wax, either in the middle of the church, or near the deceased’s tomb, where the priest pronounces a solemn abdication of the deceased. There are likewise private masses, said for stolen or strayed goods or cattle; for health; for travellers, &c. which go under the name of votive masses. There is still a further distinction of masses denominated from the countries in which they were used: thus the Gothic mass, or misa mofarabum, is that used among the Goths when they were masters of Spain, and which is still kept up at Toledo and Salamanca; the Ambrosian mass is that composed by St Ambrose, and used only at Milan, of which city he was bishop; the Gallic masses, used by the ancient Gauls; and the Roman masses, used by almost all the churches in the Romish communion.

MASSA, the capital of the duchy of Massa Carrara, in Italy, situated between the territories of Lucca and Genoa: E. long. 10° 40', N. lat 43° 55'.

MASSACHUSET-colony, the principal sub-division of New-England, is bounded by New Hampshire, on the north; by the Atlantic ocean, on the east and south; and by Connecticut and New York, on the west. It is about 100 miles long, and 40 broad.

MASSALIANS, a set of enthusiasts who sprang up about the year 361, in the reign of the emperor Constantius, who maintained that men have two souls, a celestial and a diabolical, and that the latter is driven out by prayer.

MASSETER, in anatomy. See Anatomy, p. 221.

MASSORA, in matters of literature, a critical work, containing remarks on the verses, words, letters, and vowel-points of the Hebrew text of the bible; a work more laborious than useful.

MASS, in naval architecture, a large timber in a ship, for sustaining the yards, sails, &c.

In large vessels there are four masts, viz. the main-mast, fore-mast, mizen-mast, and bowsprit. See Ship-building.

MASTER, in general, is a title of authority; as, the grand master of Malta, the master of St Lazarus, &c. The Romans had a great many officers thus denominated; as, the master of the people, or dictator; the master of the cavalry, foot, centur, &c. Master of arts, is the first degree taken up in universities. Masters in chancery, in ordinary, of which there are twelve, the master of the rolls being chief, are usually chosen out of the barristers of the common law, and sit in chancery, or at the rolls, as assistants to the lord chancellor and master of the rolls.

Master of the horse, a great officer of the crown, who orders all matters relating to the king’s stables, races, breed of horses; and commands the equestrians and all the other officers and tradesmen employed in the king’s stables. His coaches, horses, and attendants are the king’s, and bear the king’s arms and livery.

Master of the revels, an officer who orders all things relating to the performance of plays, masques, balls, &c. at court.

Master of the rolls, a patent officer for life, who has the custody of the rolls of parliament and patents which pass the great-seal, and of the records of chancery, as also commissions, deeds, recognizances, which, being made of rolls of parchment, gave rise to the name.

In absence of the chancellor, he sits as judge in the court of chancery: at other times, he hears causes in the rolls chapel, and makes orders; but all hearings before him are appealable to the chancellor.

Master of the wardrobe, an officer under the lord chamberlain, who has the care of the royal robes, as well as the wearing apparel, collar, George, and garter, &c. He has also the charge of all former kings and queens robes remaining in the Tower, all hangings, bedding, &c. for the king’s house, the charge and delivery of velvet and scarlet allowed for livery.

He has under him a clerk of the robes, wardrobe-keeper, a yeoman, &c.

Master-wort, in botany. See Imperator.

Mastication, the action of chewing, or of agitating the solid parts of our food between the teeth, by means of the motion of the jaws, the tongue, and the lips, whereby it is broken into small pieces, impregnated with saliva, and so fitted for deglutition and a more easy digestion.

Mastic, in the materia medica, a solid resin, of a pale, yellow, white colour, brought to us principally from the island of Chios, in drops or tears as it naturally forms itself in exudating from the tree, about the bigness and much in the form of a pea. It is to be chosen clear, pellucid, and of a pale yellowish colour, well scented, and brittle. We meet with a kind of cement sometimes kept in the shops under the name of mastic. It is composed of mastic, and several other ingredients, and is formed into cakes for use. This is intended for the service of the lapidaries, to fill up cracks in stones, and for other such purposes: but
MAT (30) MAT

but is by no means to be used as mastich for any of the medicinal purposes.

Mastich is detergent, astringent, and stomachic; it is greatly recommended in invertebrate coughs and against spitting of blood. It strengthens the stomach, affords digestion, and stops vomiting.

Mastigadour, or slabbering-bit, in the Maddeil kingdom.

Matapan, a country in the fourth part of Africa, learning; but, at present, denotes that science which furnishes us with the most general and scrupulous a manner as we possibly could; since we cannot but remark, that it is too frequent in writers which ought to be about half a foot high.

Matapan, a city and port town of the hither India: E. long. 81°, and N. lat. 16° 18'.

Matamane, a country in the fourth part of Africa, bounded by Benguelo, on the north; by Manomotapa, on the east, by Capetria, on the south; and by the Atlantic ocean, on the west.

Matapan Cape, in the Morea, the fourteenth promontory of Europe, situated in E. long. 22°, N. lat. 76°.

Match, a kind of rope slightly twisted, and prepared to retain fire for the uses of artillery, mines, fire-works, &c.

It is made of hempen tow, spun on the wheel like cord, but very slack; and is composed of three twists, which are afterwards again covered with tow, so that the twists do not appear at all, it is boiled in the lettuce of old wines. This, when once lighted at the end, burns on gradually and regularly, without ever going out, till the whole be consumed: the hardest and driest match is generally the best.

Matching, in the wine trade, the preparing vessels to preserve wines and other liquors, without their growing sour or vapid. The method of doing it, is as follows: melt brimstone in an iron ladle, and when thoroughly melted, dip it into flaps of coarse linen-cloth; take these out, and let them cool: this the wine cooper calls a matching; take one of these matches, set one end of it on fire, and put it into the bung-hole of a cask; let it burn nearly out: then drive in the bung tightly, and set the cask aside for an hour or two. At the end of this time examine the cask, and you will find that the sulphur has communicated a violent purgant and suffocating scent to the cask, with a considerable degree of acidity, which is the gas and acid spirit of the sulphur. The cask may after this be filled with a small wine, which has scarce done its fermentation; and bunging it down tight, it will be kept good, and will soon clarify: this is a common and very useful method; for many poor wines could scarce be kept potable even a few months without it.

Dura Mater. See Anatomy, p. 284.

Pia Mater. See Anatomy, p. 285.

Materan, the capital of a kingdom of the same name, situated on the south coast of the island of Java. This city is said to lie in E. long. 110°, S. lat 7° 45'.

Materia Sutitis, denotes a fine subtile matter, which the Carthusians use to preserve and penetrate freely the pores of all bodies, to fill up all their pores so as not to leave the least vacancy or interstice between them: they had recourse to this machine to support the doctrine of an absolute plenum, and to make it consist with the phenomena of motion, &c.

Materia medica, comprehends all the substances either used in medicine in their natural state, or which afford preparations that are fo; these belong partly to the animal, partly to the vegetable, and partly to the mineral kingdom.

The preparations and virtues of all which are delivered under their respective articles, but in as concise and scrupulous a manner as we possibly could; since we cannot but remark, that it is too frequent in writers on the materia medica, to give us rather encomiums than impartial accounts of the simples they treat of.

Mathematics, originally signified any discipline or learning; but, at present, denotes that science which teaches, or contemplates, whatever is capable of being numbered or measured, in so far as comparable or measurable; and accordingly is subdivided into Arithmetic, which has numbers for its object, and Geometry, which treats of magnitude. See Arithmetic and Geometry.

Mathematics are commonly distinguished into pure and speculative, which consider quantity abstractedly; and mixed, which treat of magnitude as subsisting in material bodies, and consequently are interwoven every where with physical considerations.

Mixed mathematics are very comprehensive; since to them many may be referred Astronomy, Optics, Geography, Hydraulics, Mechanics, Fortification, Navigation, &c. See the articles Astronomy, Optics, &c.

Pure mathematics have one peculiar advantage, that they occasion no disputes among wrangling disputants, as in other branches of knowledge; and the reason is, because the definitions of the terms are premised, and every body that reads a proposition has the same idea of every part of it. Hence it is easy to put an end to all mathematical controversies, by shewing either that our adversary has not stuck to his definitions, or has not laid down true premises, or else that he has drawn false conclusions from true principles; and in case we are able to do neither of these, we must acknowledge the truth of what he has proved.

It is true, that in mixed mathematics, where we reason mathematically upon physical subjects, we cannot give such just definitions as the geometers: we must therefore rest content with descriptions; and they will be of the same use as definitions, provided we are consistent with ourselves, and always mean the same thing by those terms we have once explained.

Dr. Barrow gives a most elegant description of the excellence and usefulness of mathematical knowledge, in his inaugural oration, upon being appointed professor of mathematics at Cambridge.

The mathematics, he observes, effectually exercise, not vainly delude, nor vexationally torment, flaudous minds with obscure abstractions; but plainly demonstrate everything within their reach, draw certain conclusions, instruct by profitable rules, and unfold pleasant questions. These disciplines likewise enure and corroborate the mind to a constant diligence in study; they wholly deliver us from a credulous simplicity, most strongly fortify us against the vanity of scepticism, ef- fectual
MAT (31)

factually restrain us from a rash presumption, most easily incline us to a due affect, perfectly subject us to the government of right reason. While the mind is abstracted and elevated from sensible matter, distinctly views pure forms, conceives the beauty of ideas, and investigates the harmony of proportions; the manners themselves are distinctly corrected and improved, the affections composed and rectified, the fancy calmed and settled, and the understanding raised and excited to more divine contemplations.


MATRICARI, in botany, a genus of the family Matricaria, aregillerkept of the admission of officers and persons entered into any body or society, whereto a lift is made.

MATRIX, in anatomy. See Anatomy, p. 274.

MATRONALIA, a festival of the ancient Roman matrons, from whom it had its name. It was celebrated on the kalends of March in honour of the god Mars; and was to the Roman ladies what the festival of the Saturnalia was to their husbands; for at this time they served their women slaves at tables, and received presents from their husbands. See Saturnalia.

MATER, whatever is extended and capable of making resistance: hence, because all bodies, whether solid or fluid, are extended, and do resist, we conclude that they are material, or made up of matter. See Mechanics.


St. Matthew wrote his gospel in Judea, at the request of some he had converted; and it is thought he began it in the year 41, eight years after Christ's resurrection. It was written, according to the testimony of all the ancients, in the Hebrew or Syrian language, which was then common in Judea, but the Greek version of it, which now passes for the original, it as old as the apothegms.

St. Matthew's day, a festival of the Christian church, observed on September 21.

St. Matthew, in geography, a small island on the coast of Guinea, planted by the Portuguese, but deserted: W. long. 9°, S. lat. 2° 30'.

St. MATTHIAS's day, a festival of the Christian church, observed on the 24th of February.

MATTINS, the first canonical hour, or the first part of the daily service, in the Roman church.

MATTURANTS, in pharmacy, medicines which promote the suppuration of tumours.

MAUNDY Thursday, is the Thursday in Passion-week, which was called Maunday or Mandate-thursday, from the command which our Saviour gave his apostles which he gave them to love one another, after he had washed their feet as a token of his love to them.

St. MAUR, an island of the Mediterranean, situated between the provinces of Epirus, and the island of Cephalonia; subject to Venice: E. long. 21°, N. lat. 38° 30'.

MAURICE, or Moritius, an island in the Indian ocean, subject to the Dutch: E. long. 55°, S. lat. 20°.

MAURIENNE, St. John, the capital of the territory of Maurienne, in Savoy: E. long. 6° 10', N. lat. 45° 18'.

MAURITANIA, the ancient name of the coast of Barbary, from the city of Tangier to that of Algiers: the west part of it, in which Tangier stands, was called Mauritania Tingitana; and that farther east, Mauritania Caesarienfis.

MAUSOLEUM, a magnificent tomb, or funeral monument. The word is derived from Mausolus, king of Caria, to whom Artemisia, his wife, erected a lofty, flatly ornamented monument, esteemed one of the wonders of the world, and called it, from his name, Mausoleum.

St. MAWES, a port and borough town of Cornwall; situated twenty miles north of the Lizard. It sends two members to parliament.

MAXILLA, the jaws, or those parts of an animal in which the teeth are set.

MAXIM, an established proposition or principle; in which loose it denotes much the same with axiom.

MAXIMUM, in mathematics, denotes the greatest quantity attainable in any given case.

It is a quantity conceived to be generated by motion, increases, or decreases, till it arrives at a certain magnitude or position, and then on the contrary grows lesser or greater, and it be required to determine the said magnitude or position, the question is called a problem de maximis et minimis.

MAY, the fifth month of the year, consisting of thirty-one days.

MAY, is also the name of a little island, in the mouth of the frith of Forth, in Scotland.

MAYENNE, a city of France, in the province of Orleans: W. long. 45°, and N. lat. 48° 20'.

MAYO, one of the Cape Verde islands: W. long. 23° 30', N. lat. 15°.

Mayo, is also a county of Ireland, in the province of Connaught, having Sligo on the north, and Roscommon on the south.

MAYOR,
MAYOR, the chief magistrate of a city or town, chosen annually out of the aldermen.

MAZARA, the capital of the province of the same name in Sicily, situated on the south-west coast; E. long. 12° 30', N. lat. 37° 42'.

MEAD, an agreeable liquor, made of honey and water. There are many receipts for making mead, of which the following is one of the best. Take four gallons of water, and as much honey as will make it bear an egg; add to this, the rind of three lemons; boil it, and scum it as it rifes. Then take it off the fire, and add the three lemons cut in pieces; pour it into a clean tub or open vessel, and let it work for three days: then scum it well, and pour off the clear part into a cask, and let it stand open till it ceases to make a hissing noise; then stop it up close, and in three months time it will be fine and fit for bottling.

If you would give it a finer flavour, take cloves, mace, and nutmeg, of each four drams; beat them small, tie the powder in a piece of cloth, and put it into the cask.

MEADOW, in its general signification, means pature or grazed-land, annually mown for hay; but it is more particularly applied to lands that are so low as to be too moist for cattle to graze upon them in winter without spoiling the sward.

MEAN, in general, denotes the middle between two extremes: thus we say, mean distance, mean proportion, &c.

MEASLES, in medicine, a cutaneous disease, attended with a fever, in which there is an appearance of eruption, frequently attended with a suppuration. They are more frequent in children than in adults, and more common among females than males. The principal symptoms are a rise of temperature, a swelling of the lymphatic glands in the neck, and the appearance of small red papules on the face, neck, and body.

MEASUREMENT, in geometry, denotes any quantity assumed as one, or unity, to which the ratio of other homogenous or similar quantities is expressed.

MEASURE, in a legal and commercial sense, denotes a certain quantity or proportion of anything bought, sold, valued, or the like. Measures are then various, according to the various kinds and dimensions of the things measured. Hence arise linear or longitudinal measures, for lines or lengths; square measures, for areas or surfaces; and solid or cubic measures, for bodies and their capacities. All which again are very different in different countries, and in different ages, and even many of them for different commodities. Whence arise other divisions of ancient and modern measures, domestic and foreign ones, dry measures, liquid measures, &c. For the different kinds of measures, see Arithmetic, Geometry, and the particular names of measures, as they occur in the alphabetical order.

MEASURES is also used to signify the cadence and time observed in poetry, dancing, and music, to render them regular and agreeable.

MEASURE, in music, the interval or space of time which the person who beats time takes between the rising and falling of his hand, in order to conduct the movement sometimes quicker and sometimes slower, according to the music or subject that is to be sung or played.

MEAT. See Food, Diet, Drink, &c.

MEATH, the name of two counties in Ireland, in the province of Leinster, distinguished by the epithets East and West.

MEATUS AUDITORIUS, in anatomy. See Anatomy, p. 296.

MEAUX, a city in France, twenty-four miles north-east of Paris.

MECCA, the capital of Arabia, and place of Mohammed's nativity: E. long 43° 30', N. lat. 21° 20'. It is a large well-built city, in the middle of which stands the caaba, or temple.

M E C H A N I C S.

This term, in the common acceptance, implies no more than the nature of what is called the mechanical powers, together with the combination of these powers in the construction of machines. But as the general properties of matter and central forces are necessary in order to a thorough knowledge of mechanics, we have joined all these subjects together under the general name of Mechanics.

Of Matter, and its Properties.

By the word matter is here meant every thing that has length, breadth, and thickmess, and resists the touch. The inherent properties of matter are solidity, inactivity, mobility, and divisibility. The solidity of matter arises from its having length, breadth, thickmess; and hence it is that all bodies are comprehended under some shape or other, and that every particular body hinders all others from occupying the same part of space which it poiffesses. Thus, if a piece of wood or metal be squeezed ever so hard between two plates, they cannot be brought into contact. And even water or air has this property; for if a small quantity of it be fixed between any other bodies, they cannot be brought to touch one another.

A second property of matter is inactivity, or pafliveness; by which it always endeavour to continue in the state that it is in, whether of rest or motion. And therefore, if one body contains twice or thrice as much matter as another body does, it will have twice or thrice as much inactivity; that is, it will require twice or thrice as much force to give it an equal degree of motion, or to stop it after it hath been put into such a motion.

That matter can never put itself into a motion is allowed by all men. For a stone, lying on the plain surface of the earth, never removes itself from that place, nor does any one imagine it ever can. But most people are apt to believe, that all matter has a propensity to fall from a state of motion into a state of rest; because they see, that if a stone
frob or a cannon-ball be put into ever fo violent a motion, it soon stops; not considering that this stoppage is caused, 1. By the gravity or weight of the body, which links it to the ground in spite of the impulse; and, 2. By the resist-ance of the air through which it moves, and by which its velocity is retarded every moment till it falls.

A bowl moves but a short way upon a bowling-green; because the roughness and unevenness of the grassy surface soon creates friction enough to stop it. But if the ground were perfectly level, and smooth, and the bowl were perfectly hard, round, and smooth, it would go a great way further; as it would have nothing but the air to resist it: if then the air were taken away, the bowl would go on without any friction, and consequently without any diminution of the velocity it had at setting out: and therefore, if the green were extended quite around the earth, the bowl would go on round and round the earth, for ever.

If the bowl were carried several miles above the earth, and there projected in a horizontal direction, with such a velocity as would make it move more than a semidiameter of the earth, in the time it would take to fall to the earth by gravity: in that case, and if there were no refilling medium in the way, the bowl would not fall to the earth at all; but would continue to circulate round it, keeping always in the same tract, and returning to the same point from which it was projected, with the same velocity as at first. In this manner the moon moves round the earth, although it be as inactive and dead as any stone upon it.

The third property of matter is mobility; for we find that all matter is capable of being moved, if a sufficient degree of force be applied to overcome its inactivity or resistance.

The fourth property of matter is divisibility, of which there can be no end. For since matters can never be annihilated by cutting or breaking, we can never imagine it to be cut into small particles, but that if one of them be laid on a table, the uppermost side of it will be further from the table than the undermost side.

Plate CV. fig. 1. That matter is infinitely divisible in a mathematical sense, is easy to be demonstrated. For, let AB be the length of a particle to be divided; and let it be touched at opposite ends by the parallel lines CD and EF, which suppose to be infinitely extended beyond D and F. Set off the equal divisions GH, HI, &c. on the line EF, towards the right hand from B; and take a point, as at R, any where towards the left hand from A, in the line CD: Then, from this point draw the right lines RG, RH, RI, &c. each of which will cut off a part from the particle AB. But after any finite number of such lines are drawn, there will still remain a part, as AP, at the top of the particle, which can never be cut off; because the lines DR and EF being parallel, no line can ever be drawn from the point R to any point of the line EF that will coincide with the line RD. Therefore the particle AB contains more than any finite number of parts.

A fifth property of matter is attraction, which seems rather to be infused than inherent. Of this there are four kinds, viz. cohesion, gravitation, magnetism, and electricity.

The attraction of cohesion is that by which the small parts of matter are made to stick and cohere together. Of this we have several instances, some of which follow.

1. If a small glass tube, open at both ends, be dipped in water, the water will rise up in the tube to a considerable height above its level in the basin; which must be owing to the attraction of a ring of particles of the glass all around in the tube, immediately above those to which the water at any instant rises. And when it has risen so high, that the weight of the column balances the attraction of the tube, it rises no higher. This can be no ways owing to the preffure of the air upon the water in the basin; for, as the tube is open at top, it is full of air above the water, which will press as much upon the water in the tube as the neighbouring air does upon any column of an equal diameter in the basin. Besides, if the same experiment be made in an exhausted receiver of the air-pump, there will be found no difference.

2. A piece of loaf-sugar will draw up a fluid, and a sponge will suck in water; and on the same principle sap ascends in trees.

3. If two drops of quicksilver be placed near each other, they will run together, and become one large drop.

4. If two pieces of lead be scraped clean, and pressed together with a twist, they will attract each other so strongly, as to require a force much greater than their own weight to separate them. And this cannot be owing to the preffure of the air, for the same thing will hold in an exhausted receiver.

5. If two polished plates of marble or brass be put together, with a little oil between them to fill up the pores in their surfaces, and prevent the lodgement of any air; they will cohere so strongly, even if suspended in an exhausted receiver, that the weight of the lower plate will not be able to separate it from the upper one. In putting these plates together, the one should be rubbed upon the other, as a joiner does two pieces of wood when he glues them.

6. If two pieces of cork, equal in weight, be put near each other in a basin of water, they will move equally fast toward each other, with an accelerated motion, until they meet: and then, if either of them be moved, it will draw the other after it. If two corks of unequal weights be placed near each other, they will approach with accelerated velocities inversely proportionate to their weights: that is, the lighter cork will move as much faster than the heavier, as the heavier exceeds the lighter in weight. This shews that the attraction of each cork is in direct proportion to its weight or quantity of matter.

This kind of attraction reaches but to a very small distance; for, if two drops of quicksilver be rolled in dust, they will not run together, because the particles of dust keeps them out of the sphere of each other's attraction.

Where the sphere of attraction ends, a repulsive force begins; thus, water repels most bodies till they are wet; and hence it is, that a small needle, if dry, swims upon water; and flies walk upon it without wetting their feet.

The repelling force of the particles of a fluid is but small; and therefore, if a fluid be divided, it easily unites again. But if glass, or any other hard substance, be broke
broke into small parts, they cannot be made to flick together again without being first wetted; the repulsion being too great to admit of a re-union.

The repelling force between water and oil is so great, that we find it almost impossible to mix them so that they cannot ever be brought near together by condenstation as to make them flick or cohere. Hence it is, that when the weight of the incumbent atmosphere is taken off from any small quantity of air, that quantity will diffuse itself so as to occupy (in comparison) an infinitely greater portion of space than it did before.

Attraction of gravitation is that power by which distant bodies tend towards one another. Of this we have daily instances in the falling of bodies to the earth. By this power in the earth it is, that bodies, on whatever side, fall in lines perpendicular to its surface; and consequently, on opposite sides, they fall in opposite directions; all towards the centre, where the force of gravity is as it were accumulated; and by this power it is, that bodies on the earth's surface are kept to it on all sides, so that they cannot fall from it. And as it acts upon all bodies in proportion to their respective quantities of matter, without any regard to their bulks or figures, it accordingly constitutes their weight. Hence,

If two bodies which contain equal quantities of matter, were placed at ever so great a distance from one another, and then left at liberty in free space; if there were no other bodies in the univerfe to affect them, they would fall equally swift towards one another by the power of gravity, with velocities accelerated as they approached each other; and would meet in a point which was half way between them at first. Or, if two bodies containing unequal quantities of matter, were placed at any distance, and left in the same manner at liberty, they would fall towards one another with velocities which would be in an inverse proportion to their respective quantities of matter; and moving faster and faster in their mutual approach, would at last meet in a point as much nearer to the place from which the heavier body began to fall, than to the place from which the lighter body began to fall, as the quantity of matter in the former exceeded that in the latter.

All bodies that we know of have gravity or weight. For, that there is no such thing as positive levity, even in smoke, vapours, and fumes, is demonstrable by experiments on the air-pump; which shews, that although the smoke of a candle ascends to the top of a tall receiver, when full of air; yet upon the air's being exhausted out of the receiver, the smoke falls down to the bottom of it. So, if a piece of wood be immersed in a jar of water, the wood will rise to the top of the water, because it has a less degree of weight than its bulk of water has; but if the jar be emptied of water, the wood falls to the bottom.

As every particle of matter has its proper gravity, the effect of the whole must be in proportion to the number of the attracting particles; that is, as the quantity of matter in the whole body. This is demonstrable by experiments on pendulums; for if they are of equal lengths, whatever their weights be, they vibrate in equal times. Now it is plain, that if one be double or triple the weight of another, it must require a double or triple power of gravity to make it move with the same celerity; just as it would require a double or triple force to project a bullet of twenty or thirty pound weight with the same degree of swiftness that a bullet of ten pounds would require.

Hence, it is evident, that the power or force of gravity is always proportional to the quantity of matter in bodies, whatever their bulks or figures are.

Gravity also, like all other virtues or emanations which proceed or issue from a centre, decreases as the distance multiplied by itself increases: that is, a body at twice the distance of another attracts with only a fourth part of the force; at thrice the distance, with a ninth part; at four times the distance, with a fourteenth part; and so on. This too is confirmed by comparing the distance which the moon falls in a minute from a right line touching her orbit, with the distance through which heavy bodies near the earth fall in that time; and also by comparing the forces which retain Jupiter's moons in their orbits, with their respective distances from Jupiter. These forces will be explained afterwards.

The velocity which bodies near the earth acquire in descending freely by the force of gravity, is proportional to the times of their descent. For, as the power of gravity does not consist in a single impulse, but is always operating in a constant and uniform manner, it must produce equal effects in equal times; and consequently in a double or triple time, a double or triple effect; and so, by acting uniformly on the body, must accelerate its motion proportionably to the time of its descent.

To be a little more particular on this subject, let us suppose that a body begins to move with a celerity constantly and gradually increasing, in such a manner, as would carry it through a mile in a minute; at the end of this space it will have acquired such a degree of celerity, as is sufficient to carry it two miles the next minute, thro' it should then receive no new impulse from the cause by which its motion had been accelerated; but if the same accelerating cause continues, it will carry the body a mile farther; on which account, it will have run through four miles at the end of two minutes; and then it will have acquired such a degree of celerity, as is sufficient to carry it through a double space in as much more time, or eight miles in two minutes, even though the accelerating force should act upon it no more. But this force still continuing to operate in an uniform manner, will again, in an equal time, produce an equal effect; and so, by carrying it a mile further, cause it to move through five miles the third minute; for, the celerity already acquired, and the celerity still acquiring, will each have its complete effect. Hence we learn, that if the body should move one mile the first minute, it would move three the second, five the third, seven the fourth, nine the fifth, and so on in proportion.

And thus it appears, that the spaces described in successive equal parts of time, by an uniformly accelerated motion, are always as the odd numbers 1, 3, 5, 7, 9, &c.
and consequently, the whole spaces are as the squares of the times, or of the last acquired velocities. For, the continued addition of the odd numbers yields the squares of all numbers from unity upwards. Thus, 1, is the first odd number, and the square of 1 is 1; 3 is the second odd number, and this added to 1 makes 4, the square of 2; 5 is the third odd number, which added to 4 makes 9, the square of 3; and so on forever. Since, therefore, the times and velocities proceed evenly and constantly as 1, 2, 3, 4, &c. but the spaces described in each equal time are as 1, 3, 5, 7, &c. it is evident that the space described,

In 1 minute will be - - 1 = square of 1
In 2 minutes - - 1+3= 4 = square of 2
In 3 minutes - 1+3+5 = 9 = square of 3
In 4 minutes 1+3+5+7=16 = square of 4 &c.

As heavy bodies are uniformly accelerated by the power of gravity in their descent, it is plain that they must be uniformly retarded by the same power in their ascent. Therefore, the velocity which a body acquires by falling, is sufficient to carry it up again to the same height from whence it fell; allowance being made for the resistance of the air, or other medium in which the body is moved. Thus, the body D (fig. 2.) in rolling down the inclined plane AB, will acquire such a velocity by the time it arrives at B, as will carry it up to the inclined plane BC, almost to C; and would carry it quite up to C, if the body and plane were perfectly smooth, and the air gave no resistance. —So, if a pendulum were put into motion in a space quite void of air and all other resistance, and had no friction on the point of suspension, it would move for ever; for the velocity it had acquired in falling through the descending part of the arc, would be still sufficient to carry it equally high in the ascending part thereof.

The centre of gravity is that point of a body in which the whole force of its gravity or weight is united. Therefore, whatever supports that point bears the weight of the whole body; and whilst it is supported, the body cannot fall, because all its parts are in a perfect equilibrium about that point.

An imaginary line drawn from the centre of gravity of any body towards the centre of the earth, is called the line of direction. In this line all heavy bodies descend, if not obstructed.

Since the whole weight of a body is united in its centre of gravity, as that centre ascends or descends we must look upon the whole body to do so too. But as it is contrary to the nature of heavy bodies to ascend of their own accord, or not to descend when they are permitted; we may be sure that, unless the centre of gravity be supported, the whole body will tumble or fall. Hence it is, that bodies stand upon their bases when the line of direction falls within the base; for in this case the body cannot be made to fall without first raising the centre of gravity higher than it was before. Thus, the inclining body ABCD, (fig. 3.) whose centre of gravity is E, stands firmly on its base CDIK, because the line of direction EF falls within the base. But if a weight, as ABGH, be laid upon the top of the body, the centre of gravity of the whole body and weight together is raised up to I; and and then, as the line of direction ID falls without the base at D, the centre of gravity I is not supported; and the whole body and weight tumble down together.

The broader the base is, and the nearer the line of direction is to the middle or centre of it, the more firmly does the body stand. On the contrary, the narrower the base, and the nearer the line of direction is to the side of it, the more easily may the body be overthrown: a less change of position being sufficient to remove the line of direction out of the base in the latter case than in the former. And hence it is, that a sphere is so easily rolled upon a horizontal plane; and that it is so difficult, if not impossible, to make things which are sharp pointed to stand upright on the point. From what hath been said, it plainly appears, that if the plane be inclined on which the heavy body is placed, the body will slide down upon the plane whilst the line of direction falls within the base; but it will tumble or roll down when that line falls without the base. Thus, the body D (fig. 4.) will only slide down the inclined plane CD, whilst the body B rolls down upon it.

When the line of direction falls within the base of our feet, we stand; and most firmly, when it is in the middle; but when it is out of that base, we immediately fall. And it is not only pleasing, but even surprising, to reflect upon the various and unthought of methods and processes which we use, to retain this position, or to recover it when it is lost. For this purpose, we bend our body forward when we rise from a chair, or when we go upstairs; and for this purpose a man leans forward when he carries a burden on his back, and backward when he carries it on his breast, and to the right or left side as he carries it on the opposite side.

The quantity of matter in all bodies is in exact proportion to their weights, bulk for bulk. Therefore, heavy bodies are as much more dense or compact than light bodies of the same bulk, as they exceed them in weight. All bodies are full of pores, or spaces void of matter; and in gold, which is the heaviest of all known bodies, there is perhaps a greater quantity of space than of matter. For the particles of heat and magnetism find an easy passageway through the pores of gold; and even water itself has been forced through them. Besides, if we consider how easily the rays of light pass through so solid a body as glass, in all manner of directions, we shall find reason to believe that bodies are exceedingly porous.

All bodies are some way or other affected by heat; and all metallic bodies are expanded in length, breadth, and thickness thereby. —The proportion of the expansion of several metals, according to the best experiments, is nearly thus. Iron and glass as 3, steel 4, copper 4 and one eighth, brass 5; tin 6, lead 6 and one eighth. An iron rod 3 feet long is about one 70th part of an inch longer in summer than in winter.

The expansion of metals by heat, is demonstrated by the following machine, called a pyrometer AA (fig. 5.) A flat piece of mahogany, in which are fixed four brass flutes B,C,D,L; and two pins, one at F, and the other at H. On the pin F turns the crooked index EI, and upon the pin H the straight index GK; against which a piece of watch-spring R bears gently, and so presses it towards
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towards the beginning of the scale MN, over which the point of that index moves. This scale is divided into inches and tenth parts of an inch: the first inch is marked 1000, the second 2000, and so on. A bar of metal O is laid into notches in the top of the fluds C and D; one end of the bar bearing against the adjusting screw P, and the other end against the crooked index E1, at a 20th part of its length from its centre of motion F. Now it is plain, that however much the bar O lengthens, it will move that part of the index E1 against which it bears just as far: but the crooked end of the same index, near H, being 20 times as far from the centre of motion F as the point is against which the bar bears, it will move 20 times as far as the bar lengthens. And as this crooked end bears against the index GK at only a 20th part of its whole length GS from its centre of motion H, the point S will move through 20 times the space that the point of bearing near H does. Hence, as 20 multiplied by 20 produces 400, it is evident, that if the bar lengthens but a 400th part of an inch, the point S will move a whole inch on the scale; and as every inch is divided into 10 equal parts, if the bar lengths but the 10th part of the 400th part of an inch, which is only the 4000th part of an inch, the point S will move the tenth part of an inch, which is very perceptible.

To find how much a bar lengthens by heat, first lay it cold into the notches of the fluds, and turn the adjusting screw P until the spring R brings the point S of the index GK to the beginning of the divisions of the scale at M; then, without altering the screw any farther, take off the bar, and rub it with a dry woollen cloth till it feels warm: and then, laying it on where it was, observe how far it pushes the point S upon the scale by means of the crooked index E1; and the point S will shew exactly how much the bar has lengthened by the heat of rubbing. As the bar cools, the spring R bearing against the index KG, will cause its point S to move gradually back towards M in the scale: and when the bar is quite cold, the index will rest at M, where it was before the bar was made warm by rubbing. The indexes have small rollers under them at I and K; which, by turning round on the smooth wood as the indexes move, make their motions the easier, by taking off a great part of the friction, which would otherwise be on the pins F and H, and of the points of the indexes themselves on the wood.

Besides the universal properties above mentioned, there are bodies which have properties peculiar to themselves: such as the loadstone, in which the most remarkable are these, 1. It attracts iron and steel only. 2. It constantly turns one of its sides to the north and another to the south, when suspended by a thread that does not twist. 3. It communicates all its properties to a piece of steel when rubbed upon it, without losing any itself. According to Dr Helliham's experiments, the attraction of the loadstone decreases as the square of the distance increases. Thus, if a loadstone be suspended at one end of a balance, and counterpoised by weights at the other end, and a flat piece of iron be placed beneath it, at the distance of four tenths of an inch, the stone will immediately deflect and adhere to the iron. But if the stone be again removed to the same distance, and as many grains be put into the scale at the other end as will exactly counterbalance the attraction, then, if the iron be brought twice as near the stone as before, that is, only two tenths of an inch from it, there must be four times as many grains put into the scale as before, in order to be a just counterbalance to the attractive force, or to hinder the stone from deflecting and adhering to the iron. So if four grains will do in the former case, there must be sixteen in the latter. But from some later experiments, made with the greatest accuracy, it is found that the force of magnetism decreases in a ratio between the reciprocal of the square and the reciprocal of the cube of the distance; approaching to the one or the other, as the magnitudes of the attracting bodies are varied.

Several bodies, particularly amber, glafs, jet, sealing-wax, agate, and almost all precious stones, have a peculiar property of attracting and repelling light bodies when heated by rubbing. This is called electrical attraction; for the properties of which, see ELECTRICITY.

Of Central Forces.

We have already mentioned it as a necessary consequence arising from the deadness or inactivity of matter, that all bodies endeavour to continue in the state they are in, whether of rest or motion. If the body A (fig. 6.) were placed in any part of free space, where nothing either draws or impels it in any way, it would for ever remain in that part of space, because it could have no tendency of itself to remove any way from thence. If it receives a single impulse any way, as suppos from A towards B, it will go on in that direction; for, of itself it could never swerve from a right line, nor flop its course. When it has gone through the space AB, and met with no resistance, its velocity will be the same at B as it was at A; and this velocity, in as much more time, will carry it through as much more space, from B to C; and so on for ever. Therefore, when we see a body in motion; we conclude that some other substance must have given it that motion; and when we see a body fall from motion to rest, we conclude that some other body or cause stopped it.

As all motion is naturally rectilinear, it appears, that a bullet projected by the hand, or shot from a cannon, would for ever continue to move in the same direction it received at first, if no other power diverted its course. Therefore, when we see a body move in a curve of any kind whatever, we conclude it must be acted upon by two powers at least; one putting it in motion, and another drawing it off from the rectilinear course it would otherwise have continued to move in: and whenever that power, which bent the motion of the body from a straight line into a curve, ceases to act, the body will again move on in a straight line, touching that point of the curve in which it was when the action of that power ceased. For example, a pebble moved round in a sling ever so long a time, will fly off the moment it is let at liberty by slipping one end of the sling cord; and will go on in a line touching the circle it described before; which line would actually be a straight one, if the earth's attraction did not affect the pebble, and bring it down to the ground. This shews, that the natural tendency of the pebble, when put
put into motion, is to continue moving in a straight line, although by the force that moves the fling it is made to revolve in a circle.

The change of motion produced is in proportion to the force impressed: for the effects of natural causes are always proportional to the force or power of those causes. By these laws it is easy to prove that a body will describe the diagonal of a square or parallelogram, by two forces conjoin'd, in the same time that it would describe either of the sides by one force singly. Thus, suppose the body A (fig. 7.) to represent a ship at sea; and that it is drove by the wind, in the right line AB, with such a force as would carry it uniformly from A to B in a minute: then, suppose a stream or current of water running in the direction AD, with such a force as would carry the ship through an equal space from A to D in a minute. By these two forces, acting together at right angles to each other, the ship will describe the line AEC in a minute: which line (because the forces are equal and perpendicular to each other,) will be the diagonal of an exact square. To confirm this law by an experiment, let there be a wooden square ABCD (fig. 8.) so contriv'd, as to have the part BEFC made to draw out or push into the square at pleasure. To this part let the pulley H be joined, so as to turn freely on an axis, which will be at H when the piece is pushed in, and at k when it is drawn out. To this part let the ends of a straight wire k be fixed, so as to move along with it, under the pulley: and let the ball G be made to slide easily on the wire. A thread m is fixed to this ball, and goes over the pulley to I; by this thread the ball may be drawn up on the wire, parallel to the side AD, when the part BEFC is pushed as far as it will go into the square. But, if this part be drawn out, it will carry the ball along with it, parallel to the bottom of the square DC. By this means, the ball G may either be drawn perpendicularly upward by pulling the thread m, or moved horizontally along by pulling out the part BEFC, in equal times, and through equal spaces; each power acting equally and separately upon it. But if, when the ball is at G, the upper end of the thread be tied to the pin I, in the corner A of the fixed square, and the movable part BEEB be drawn out, the ball will then be acted upon by both the powers together: for it will be drawn up by the thread towards the top of the square, and at the same time carried with its wire k towards the right hand BC, moving all the while in the diagonal line L; and will be found at g when the sliding part is drawn out as far as it was before, which then will have caused the thread to draw up the ball to the top of the side of the square, just as high as it was before, when drawn up singly by the thread without moving the sliding part.

If the acting forces are equal, but at oblique angles to each other, so will the sides of the parallelogram be: and the diagonal run through by the moving body will be longer or shorter, according as the obliquity is greater or smaller. Thus, if two equal forces act conjointly upon the body A, (fig. 9.) one having a tendency to move it through the space AB in the same time that the other has a tendency to move it through an equal space AD; it will describe the diagonal AEC in the same time that either of the single forces would have caused it to describe either of the sides. If one of the forces be greater than the other, then one side of the parallelogram will be so much longer than the other. For if one force singly would carry the body through the space AE, in the same time that the other would have carried the space AD, the joint action of both will carry it in the same time through the space AHF, which is the diagonal of the oblique parallelogram ADEF.

If both forces act upon the body in such a manner, as to move it uniformly, the diagonal described will be a straight line; but if one of the forces acts in such a manner as to make the body move faster and faster as it goes forward, then the line described will be a curve. And this is the case of all bodies which are projected in rectilinear directions, and at the same time acted upon by the power of gravity, which has a constant tendency to accelerate their motions in the direction wherein it acts.

Laws of the Planetary motions.

From the uniform projectile motion of bodies in straight lines, and the universal power of gravity or attraction, arises the curvilinear motion of all the heavenly bodies. If the body A (fig. 10.) be projected along the straight line AFH in open space, where it meets with no resistance, and is not drawn aside by any power, it will go on forever with the same velocity, and in the same direction. But if, at the same moment the projectile force is given it at A, the body S begins to attract it with a force duly adjusted*, and perpendicular to its motion at A, it will then be drawn from the straight line AFH, and forced to revolve about S in the circle ATW; in the same manner, and by the same law, that a pebble is moved round in a circle. And if, when the body is in any part of its orbit (as suppose at K) a smaller body as L, within the sphere of attraction of the body K, be projected in the right line LM, with a force duly adjusted, and perpendicular to the line of attraction LK, then, the small body L will revolve about the large body K in the orbit NO, and accompany it in its whole course round the yet larger body S. But then, the body K will no longer move in the circle ATW; for that circle will now be described by the common centre of gravity between K and L. Nay, even the great body S will not keep in the centre; for it will be the common centre of gravity between all the three bodies S, K, and L, that will remain immovable there. So, if we suppose S and K connected by a wire P that has no weight, and K and L connected by a wire q that has no weight, the common centre of gravity of all these three bodies will be a point in the wire P near S; which point being supported, the bodies will be all in equilibrio as they move round it. Though indeed, strictly speaking, the common centre of gravity of all the three bodies will not be in the wire K, P.

* To make the projectile force a just balance to the gravitating power, so as to keep the planet moving in a circle, it must give such a velocity as the planet would acquire by gravity when it had fallen through half the semidiameter of that circle.
P but when these bodies are all in a right line. Here, S
may represent the sun, K the earth, and L the moon.

In order to form an idea of the curves described by two
bodies revolving about their common centre of gravity,
whilst they themselves with a third body are in motion
round the common centre of gravity of all the three; let
us first suppose E (Plate CVI. fig. 1.) to be the fun, and
e the earth going round him with any moon; and their
moving forces regulated as above. In this case, whilst
the earth goes round the sun in the dotted circle RTUWX,
&e, the fun will go round the circle ABD, whose centre
C is the common centre of gravity between the sun and
earth: the right line £ representing the mutual attrac-
tion between them, by which they are as firmly con-
ected as if they were fixed at the two ends of an iron bar
strong enough to hold them. So, when the earth is at
e, the sun will be at E; when the earth is at T, the sun
will be at F; and when the earth is at g, the sun will be
at G, &c.

Next, let us take in the moon g (at the top of the fi-
gure,) and suppose the earth to have no progressive motion
about the sun; in which case, whilst the moon revolves
about the earth in her orbit ABCD, the earth will re-
volv e in the circle S 15, whose centre R is the common
centre of gravity of the earth and moon; they being con-
 nected by the mutual attraction between them in the same
manner as the earth and fun are.

But the truth is, that whilst the moon revolves about
the earth, the earth is in motion about the sun; and now,
the moon will cause the earth to describe an irregular curve,
and not a true circle, round the sun; it being the common
centre of gravity of the earth and moon and that will then
describe the same circle which the earth would have moved
in, if it had not been attended by a moon. For, suppos-
ing the moon to describe a quarter of her progressive or-
bit about the earth in the time that the earth moves from
e to f, it is plain that when the earth comes to f, the
moon will be found at r; in which time, their common
centre of gravity will have described the dotted arc RrT,
the earth the curve Rrf, and the moon the curve q 14r.
In the time that the moon describes another quarter of
her orbit, the centre of gravity of the earth and moon
will describe the dotted arc T 2 U, the earth the curve
f 6g, and the moon the curve r 15; and so on.—And
thus, whilst the moon goes once round the earth in her
progressive orbit, their common centre of gravity describes
the regular portion of a circle R 1 T 2 U 3 V 4 W, the earth
the irregular curve R 1 f 6 g 7 b 8 i, and the moon the
yet more irregular curve q 14 r 1 5 r 1 6 b 1 7 y; and
then, the same kind of tracks over again.

The centre of gravity of the earth and moon is 6000
miles from the earth's centre towards the moon; there-
fore the circle S 13 which the earth describes round that
centre of gravity (in every course of the moon round her
orbit) is 12000 miles in diameter. Consequently, the
earth is 12000 miles nearer the sun at the time of full
moon than at the time of new. [See the earth at f and
at h.]

To avoid confusion in so small a figure, we have sup-
pused the moon to go only twice and a half round the earth,
in the time that the earth goes once round the sun: it
being impossible to take in all the revolutions which she
makes in a year, and to give a true figure of her path,
unless we should make the semidiameter of the earth's or-
it at least 84 inches; and then, the proportional semidi-
diameter of the moon's orbit would be only a quarter of
an inch.

If the moon made any complete number of revolutions
about the earth in the time that the earth makes one re-
volution about the sun, the paths of the sun and moon
would return into themselves at the end of every year; and
so be the fame all over again: but they return not into
themselves in less than 19 years nearly; in which time,
the earth makes nearly 19 revolutions about the sun, and
the moon 233 about the earth.

If the planet A (Plate CV. fig. io.) be attracted to-
wars the sun, with such a force as would make it fall
from A to B, in the time that the projectile impulse would
have carried it from A to F, it will describe the arc AG
by the combined action of these forces, in the same time
that the former would have caused it to fall from A to B,
or the latter have carried it from A to F. But, if the
projectile force had been twice as great, that is, such as
would have carried the planet from A to H, in the same
time that now, by the supposition, it carries it only from
A to F; the sun's attraction must then have been four
times as strong as formerly, to have kept the planet in the
circle ATW; that is, it must have been such as would
have caused the planet to fall from A to E, which is four
times the distance of A from B, in the time that the pro-
jectile force singly would have carried it from A to H,
which is only twice the distance of A from F. Thus, a
double projectile force will balance a quadruple power
of gravity in the same circle; as appears plain by the figure,
and shall soon be confirmed by an experiment.

Plate CVI. fig. 2. The whirling-table is a machine
contrived for shewing experiments of this nature. AA is
a strong frame of wood, B a winch or handle fixed on the
axis C of the wheel D, round which is the cast-iron string
F, which also goes round the small wheels G and K,
crossing between them and the great wheel D. On the
upper end of the axis of the wheel G, above the frame,
is fixed the round board d, to which the bearer MSX
may be fastened occasionally, and removed when it is not
wanted. On the axis of the wheel H is fixed the bearer
NTZ: and it is easy to see, that when the winch B is
turned, the wheels and bearers are put into a whirling mo-
tion.

Each bearer has two wires, W, X, and Y, Z, fixed and
screwed tight into them at the ends by nuts on the out-
side. And when these nuts are unscrewed, the wires may
draw in order to change the balls U and V, which
slide upon the wires by means of bras loops fixed into
the balls, which keep the balls up from touching the
wood below them. A strong silk line goes through each
ball, and is fixed to it at any length from the centre of the
bearer to its end, as occasion requires, by a nut-screw
at the top of the ball; the flank of the screw going into
the centre of the ball and preffing the line against the un-
der side of the hole that it goes through.—The line goes
from the ball, and under a small pulley fixt in the middle
of the bearer; then up through a socket in the round
plate.
plate (see S and T) in the middle of each bearer; then through a slit in the middle of the square top (O and P) of each tower, and, going over a small pulley on the top, comes down again the same way, and is at last fastened to the upper end of the socket fixed in the middle of the above-mentioned round plate. These plates S and T have each four round holes near their edges for letting them slide up and down upon the wires which make the corner of each tower. The balls and plates being thus connected each by its particular line, it is plain, that if the balls be drawn outward, or towards the ends M and N of their respective bearers, the round plates S and T will be drawn up to the top of their respective towers O and P.

There are several brass weights, some of two ounces, some of three, and some of four, to be occasionally put within the towers O and P, upon the round plates S and T: each weight having a round hole in the middle of it, for going upon the sockets or axes of the plates, and is slit from the edge to the hole, for allowing it to be slipped over the forefaid line which comes from each ball to its respective plate.

The experiments to be made by this machine are,

1. Take away the bearer MX, and take the ivory ball a, to which the line or silk cord b is fastened at one end; and having made a loop on the other end of the cord, put the loop over a pin fixed in the centre of the board d. Then, turning the winch B to give the board a whirling motion, you will see that the ball does not immediately begin to move with the board; but, on account of its inactivity, it endeavour to continue in the state of rest which it was in before.—Continue turning, until the board communicates an equal degree of motion with its own to the ball; and then turning on, you will perceive that the ball will remain upon one part of the board, keeping the same velocity with it, and having no relative motion upon it, as is the case with every thing that lies upon the plane surface of the earth, which having the motion of the earth communicated to it, never endeavour to remove from that place. But flop the board suddenly by hand, and the ball will go on, and continue to revolve upon the board, until the friction thereof stops its motion: which shews, that matter being once put into motion, would continue to move for ever, if it met with no resistence. In like manner, if a person stands upright in a boat before it begins to move, he can stand firm; but the moment the boat sets off, he is in danger of falling towards that place which the boat departs from: because, as matter, he has no natural propensity to move. But when he acquires the motion of the boat, let it be ever so swift, if it be smooth and uniform, he will stand as upright and firm as if he was on the plain shore; and if the boat strike against any obstacle, he will fall towards that obstacle; on account of the propensity he has, as matter, to keep the motion which the boat has put him into.

2. Take away this ball, and put a longer cord to it, which may be put down through the hollow axis of the bearer MX, and wheel G, and fix a weight to the end of the cord below the machine; which weight, if left at liberty, will draw the ball from the edge of the whirling-board to its centre.

Draw off the ball a little from the centre, and turn the winch; then the ball will go round and round with the board, and will gradually fly off farther and farther from the centre, and raise up the weight below the machine; which shews that all bodies revolving in circles have a tendency to fly off from these circles, and must have some power acting upon them from the centre of motion, to keep them from flying off. Stop the machine, and the ball will continue to revolve for some time upon the board; but as the friction gradually stops its motion, the weight acting upon it will bring it nearer and nearer to the centre in every revolution, until it brings it quite thither. This shews, that if the planets met with any resistence in going round the sun, its attractive power would bring them nearer and nearer to it in every revolution, until they fell into it.

3. Take hold of the cord below the machine with one hand, and with the other throw the ball upon the round board as it was at right angles to the cord, by which means it will go round and round upon the board. Then, observing with what velocity it moves, pull the cord below the machine, which will bring the ball nearer to the centre of the board, and you will see that the nearer the ball is drawn to the centre, the faster it will revolve; as those planets which are nearest the sun revolve faster than those which are more remote; and not only go round sooner, because they describe smaller circles, but even move faster in every part of their respective circles.

Take away this ball, and apply the bearer MX, whose centre of motion is in its middle at w, directly over the centre of the whirling-board d. Then put two balls (V and U) of equal weights upon their bearing wires; and having fixed them at equal distances from their respective centres of motion w and x upon their silk cords, by the screw nuts, put equal weights in the towers O and P. Lastly, put the catgut strings E and F upon the grooves G and H of the small wheels; which being of equal diameters, will give equal velocities to the bearers above, when the winch B is turned; and the balls U and V will fly off towards M and N, and will raise the weights in the towers at the same instant. This shews, that when bodies of equal quantities of matter revolve in equal circles with equal velocities, their centrifugal forces are equal.

5. Take away these equal balls, and, instead of them, put a ball of fix ounces into the bearer MX, at a fixth part of the distance wu from the centre, and put a ball of one ounce into the opposite bearer, at the whole distance xy, which is equal to uw from the centre of the bearer; and fix the ball at these distances on their cords, by the screw nuts; at top; then the ball U, which is six times as heavy as the ball V, will be at only a fixth part of the distance from its centre of motion; and conseqently will revolve in a circle of only a fixth part of the circumference of the circle in which V revolves. Now, let any equal weights be put into the towers; and the machine be turned by the winch; which (as the catgut string is on equal wheels below) will cause the balls to revolve in equal times; but V will move six times as fast as U, because it revolves in a circle of six times its radius; and both the weights in the towers will rise at once. This shews, that the centrifugal forces of revolving bodies (or their
their tendencies to fly off from the circles they describe) are in direct proportion to their quantities of matter multiplied into their respective velocities, or into their distances from the centres of their respective circles. For, supposing $U$, which weighs 6 ounces, to be two inches from its centre of motion $w$, the weight multiplied by the distance is 12; and supposing $V$, which weighs only one ounce, to be 12 inches distant from its centre of motion $x$; the weight 1 ounce multiplied by the distance 12 inches is 12. And as they revolve in equal times, their velocities are as their distances from the centre, namely, as 1 to 6.

If these two balls be fixed at equal distances from their respective centres of motion, they will move with equal velocities; and if the tower $O$ has 6 times as much weight put into it as the tower $P$ has, the balls will raise their weight at the same moment. This shews, that the ball $U$, being six times as heavy as the ball $V$, has six times as much centrifugal force, in describing an equal circle with an equal velocity.

6. If bodies of equal weights revolve in equal circles with unequal velocities, their centrifugal forces are as the squares of the velocities. To prove this law by an experiment, let two balls $U$ and $V$ of equal weights be fixed on their cords at equal distances from their respective centres of motion $w$ and $x$; and then let the catgut string $E$ be put round the wheel $K$ (whose circumference is only one half of the circumference of the wheel $H$ or $G$) and over the pulleys $t$ to keep it tight; and let four times as much weight be put in the tower $P$ as in the tower $O$. Then turn the winch $B$, and the ball $V$ will revolve twice as fast as the ball $U$ in a circle of the same diameter, because they are equidistant from the centres of the circles in which they revolve; and the weights in the towers will both rise at the same instant; which shews, that a double velocity in the same circle will exactly balance a quadruple power of attraction in the centre of the circle. For the weights in the towers may be considered as the attractive forces in the centres, acting upon the revolving balls; which, moving in equal circles, is the same thing as if they both moved in one and the same circle.

7. If bodies of equal weights revolve in unequal circles, in such a manner that the squares of the times of their going round are as the cubes of their distances from the centres of the circles they describe; their centrifugal forces are inversely as the squares of their distances from those centres. For, the catgut string remaining as in the last experiment, let the distance of the ball $V$ from the centre $x$ be made equal to two of the cross divisions on its bearer, and the distance of the ball $U$ from the centre $w$ be three and a sixth part; the balls themselves being of equal weights, and $V$ making two revolutions by turning the winch in the time that $U$ makes one; so that if we suppose the ball $V$ to revolve in one moment, the ball $U$ will revolve in two moments, the squares of which are one and four: for the square of 1 is only 1, and the square of 2 is 4; therefore the square of the period or revolution of the ball $V$ is contained 4 times in the square of the ball $U$. But the distance of $V$ is 2, the cube of which is 8; and the distance of $U$ is $3^2$, the cube of which is 27 very nearly; in which 8 is contained four times; and therefore, the squares of the periods of $V$ and $U$ are to one another as the cubes of their distances from $x$ and $w$, which are the centres of their respective circles. And if the weight in the tower $O$ be four ounces, equal to the square of 2, the distance of $V$ from the centre $x$; and the weight in the tower $P$ be 10 ounces, nearly equal to the square of 3, the distance of $U$ from $w$; it will be found, upon turning the machine by the winch, that the balls $U$ and $V$ will rise their respective weights at very nearly the same instant of time. Which confirms that famous proposition of Kepler, viz. That the squares of the periodical times of the planets round the sun are in proportion to the cubes of their distances from him; and that the sun's attraction is inversely as the square of the distance from its centre: that is, 12, twice the distance, his attraction is four times less; and thrice the distance, nine times less; at four times the distance, sixteen times less; and so on, to the remotest part of the system.

8. Take off the catgut string $E$ from the great wheel $D$ and the small wheel $H$, and let the string $F$ remain upon the wheels $D$ and $G$. Take away also the bearer $MX$ from the whirling-board $d$, and instead thereof put the machine $AB$ (fig. 4.) upon it, fixing this machine to the centre of the board by the pins $c$ and $d$, in such a manner, that the end $e^\prime$ may rise above the board to an angle of 30 or 40 degrees. In the upper side of this machine there are two glass tubes $a$ and $b$, close stop at both ends; and each tube is about three quarters full of water. In the tube $a$ is a little quicksilver, which naturally falls down to the end $a$ in the water, because it is heavier than its bulk of water; and on the tube $b$ is a small cork which floats upon the top of the water at $e$, because it is lighter; and it is small enough to have liberty to rise or fall in the tube. While the board $b$ with this machine upon it continues at rest, the quicksilver lies at the bottom of the tube $a$, and the cork floats on the water near the top of the tube $b$. But, upon turning the winch, and putting the machine in motion, the contents of each tube will fly off towards the uppermost ends (which are farther from the centre of motion) the heaviest with the greatest force. Therefore, the quicksilver in the tube $a$ will fly off quite to the end $a$, and occupy its bulk of space there, excluding the water from that place, because it is lighter than quicksilver; but the water in the tube $b$ flying off to its higher end $e$, will exclude the cork from that place, and cause the cork to descend towards the lowermost end of the tube, where it will remain upon the lowest end of the tube near $b$; for the heavier body having the greater centrifugal force, will therefore possess the uppermost part of the tube; and the lighter body will keep between the heavier and the lowermost part.

This demonstrates the absurdity of the Cartesian doctrine of the planets moving round the sun in vortexes: for, if the planet be more dense or heavy than the bulk of the vortex, it will fly off therein, farther and farther from the sun; if less dense, it will come down to the lowest part of the vortex, at the sun: and the whole vortex itself must be surrounded with something like a great wall, otherwise it would fly off, planets and all together.
But while gravity exists, there is no occasion for such vortexes; and when it ceases to exist, a stone thrown upwards will never return to the earth again.

9. If a body be so placed upon the whirling board of the machine (fig. 1) that the centre of gravity of the body be directly over the centre of the board, and the board be put into ever so rapid a motion by the winch, the body will turn round with the board, but will not remove from the middle of it: for, as all parts of the body are in equilibrium round its centre of gravity, and the centre of gravity is at rest in the centre of motion, the centrifugal force of all parts of the body will be equal at equal distances from its centre of motion; and therefore the body will remain in its place. But if the centre of gravity be placed ever so little out of the centre of motion, and the machine be turned swiftly round, the body will fly off towards that side of the board on which its centre of gravity lies. Thus, if the wire C (fig. 5.) with its little ball B be taken away from the demi-globe A, and the flat side of this demi-globe be laid upon the whirling-board of the machine, so as their centres may coincide; if then the board be turned ever so quick by the winch, the demi-globe will remain where it was placed. But if the wire C be screwed in the demi-globe at d, the whole becomes one body, whose centre of gravity is now at or near d. Let the pin c be fixed in the centre of the whirling-board, and the deep groove b cut in the flat side of the demi-globe be put upon the pin, so as the pin may be in the centre of A [See fig. 6, where this groove is represented at e] and let the whirling board be turned by the winch, which will carry the little ball B (fig. 5.) with its wire C, and the demi-globe A, all round the centre-pin c; and then the centrifugal force of the little ball B, which weighs only one ounce, will be so great, as to draw off the demi-globe A, which weighs two pounds, until the end of the groove at e strikes against the pin c, and so prevents the demi-globe A from going any farther; otherwise, the centrifugal force of B would have been great enough to have carried A quite off the whirling-board. Which shews, that if the sun were placed in the very centre of the orbits of the planets, it could not possibly remain there; for the centrifugal forces of the planets would carry them quite off, and the sun with them; especially when several of them happened to be in any one quarter of the heavens. For the sun and planets are as much connected by the mutual attraction that subsists between them, as the bodies A and B are by the wire C which is fixed to them both. And even if there were but one single planet in the whole heavens to go round ever so large a sun in the centre of its orbit, its centrifugal force would soon carry off both itself and the sun. For, the greatest body placed in any part of free space could be easily moved; because if there were no other body to attract it, it could have no weight or gravity of itself; and consequently, though it could have no tendency of itself to remove from that part of space; yet it might be very easily by any other substance. And perhaps it was this consideration which made the celebrated Archimedes say, that if he had a proper place at some distance from the earth wherein to fix his machinery, he could move the whole earth.

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10. As the centrifugal force of the light body B will not allow the heavy body A to remain in the centre of motion, even though it be 24 times as heavy as B; let us now take the ball A (fig. 7.) which weighs 6 ounces, and connect it by the wire C with the ball B, which weighs only one ounce; and let the fork E be fixed into the centre of the whirling-board; then, hang the balls upon the fork by the wire C in such a manner that they may exactly balance each other; which will be when the centre of gravity between them, in the wire at d, is supported by the fork. And this centre of gravity is as much nearer to the centre of the ball A, than to the centre of the ball B, as A is heavier than B, allowing for the weight of the wire on each side of the fork. This done, let the machine be put into motion by the winch; and the balls A and B will go round their common centre of gravity d, keeping their balance, because either will not allow the other to fly off with it. For, supposing the ball B to be only one ounce in weight, and the ball A to be fix ounces; then, if the wire C were equally heavy on each side of the fork, the centre of gravity d would be fix times as far from the centre of the ball B as from the centre of the ball A, and consequently B will revolve with a velocity six times as great as A does; which will give B six times as much centrifugal force as any single ounce of A has; but then, as B is only one ounce, and A six ounces, the whole centrifugal force of A will exactly balance the whole centrifugal force of B; and therefore, each body will retain the other so as to make it keep in its circle. This shews that the sun and planets must all move round the common centre of gravity of the whole system, in order to preserve that just balance which takes place among them. For, the planets being as inactive and dead as the above balls, they could no more have put themselves into motion than these balls can; nor have kept in their orbits, without being balanced at first with the greatest degree of exactness upon their common centre of gravity by the Almighty Hand that made them and put them in motion.

Perhaps it may be here asked, that since the centre of gravity between these balls must be supported by the fork E in this experiment, what prop it is that supports the centre of gravity of the solar system, and consequently bears the weight of all the bodies in it; and by what is the prop itself supported? The answer is easy and plain; for the centre of gravity of our balls must be supported, because they gravitate towards the earth, and would therefore fall to it: but as the sun and planets gravitate only towards one another, they have nothing else to fall to; and therefore have no occasion for any thing to support their common centre of gravity; and if they did not move round that centre, and consequently acquire a tendency to fly off from it by their motions, their mutual attractions would soon bring them together; and so the whole would become one mass in the sun: which would also be the case if their velocities round the sun were not quick enough to create a centrifugal force equal to the sun's attraction.

But after all this nice adjustment, it appears evident, that the Deity cannot withdraw his regulating hand from his works, and leave them to be solely governed by the
laws which he has impressed upon them at first. For if he should once leave them so, their order would in time come to an end; because the planets must necessarily disturb one another's motions by their mutual attractions, when several of them are in the same quarter of the heavens; as is often the case; and then, as they attract the sun more towards that quarter than when they are in a manner dispersed equally around him, if he was not at that time made to describe a portion of a larger circle round the common centre of gravity, the balance would then be immediately destroyed; and as it could never restore itself again, the whole system would begin to fall together, and would in time unite in a mass at the sun.

Of this disturbance we have a very remarkable instance in the comet which appeared lately; and which, in going laft up before from the sun, went near to Jupiter, and was so affected by his attraction, as to have the figure of its orbit much changed; and not only so, but to have its period altered, and its course to be different in the heavens from what it was laft before.

11. Take away the fork and balls from the whirling-board, and place the trough AB (fig. 8.) thereon, fixing its centre to the centre of the whirling-board by the pin H. In this trough are two balls D and E, of unequal weights, connected by a wire f, and made to slide easily upon the wire c stretched from end to end of the trough, and made fast by nut-screws on the outside of the ends. Let these balls be so placed upon the wire c, that their common centre of gravity g may be directly over the centre of the whirling board. Then, turn the machine by the winch ever so swiftly, and the trough and balls will go round their centre of gravity so as neither of them will fly off; because, on account of the equilibrium, each ball detains the other with an equal force acting against it. But if the ball E be drawn a little more towards the end of the trough at A, it will remove the centre of gravity towards that end from the centre of motion; and then, upon turning the machine, the little ball E will fly off, and strike with a considerable force against the end A, and draw the great ball B into the middle of the trough. Or, if the great ball D be drawn towards the end B of the trough, so that the centre of gravity may be a little towards that end from the centre of motion, and the machine be turned by the winch, the great ball D will fly off, and strike violently against the end B of the trough, and will bring the little ball E into the middle of it. If the trough be not made very strong, the ball D will break through it.

12. The reason why the tides rise at the same absolute time on opposite sides of the earth, and consequently in opposite directions, is made abundantly plain by a new experiment on the whirling table. The cause of their rising on the side next the moon every one understands to be owing to the moon's attraction: but why they should rise on the opposite side at the same time, where there is no moon to attract them, is perhaps not so generally understood.

For it would seem that the moon would rather draw the waters (as it were) closer to that side, than raise them upon it, directly contrary to her attractive force. Let the circle abed (fig. 9.) represent the earth, with its side e turned toward the moon, which will then attract the waters so as to raise them from c to g. But the question is, why should they rise as high at that very time on the opposite side, from a to f? In order to explain this, let there be a plate AB (fig. 10.) fixed upon one end of the flat bar DC; with such a circle drawn upon it as abed (fig. 9.) to represent the round figure of the earth and sea, and such an ellipse as egfb to represent the swelling of the tide at e and g, occasioned by the influence of the moon. Over this plate AB let the three ivory balls egfb be hung by the silk lines h, i, k, fastened to the tops of the crooked wires H, I, K, in such a manner, that the ball at e may hang freely over the side of the circle e, which is farthest from the moon M (at the other end of the bar); the ball at f may hang freely over the centre, and the ball g hang over the side of the circle g, which is nearest the moon. The ball f may represent the centre of the earth, the ball g some water on the side next the moon, and the ball e some water on the opposite side. On the back of the moon M is fixt the short bar N parallel to the horizon, and there are three holes in it above the little weights p, q, r. A silk thread o is tied to the line k above the ball g, and, passing by one side of the moon M, goes through a hole in the bar N, and has the weight p hung to it. Such another thread n is tied to the line i, close above the ball f; and, passing through the centre of the moon M and middle of the bar N, has the weight q hung to it, which is lighter than the weight p. A third thread m is tied to the line h, close above the ball e, and passing by the other side of the moon M, through the bar N, has the weight r hung to it, which is lighter than the weight g.

The use of these three unequal weights is to represent the moon's unequal attraction at different distances from her. With whatever force she attracts the centre of the earth, she attracts the side next her with a greater degree of force, and the side farthest from her with a less. So, if the weights are left at liberty, they will draw all the three balls towards the moon with different degrees of force, and cause them to make the appearance shown in (fig. 11.) by which means they are evidently farther from each other than they would be if they hung at liberty by the lines h, i, k; because the lines would then hang perpendicularly. This shews, that as the moon's attraction the side of the earth, which is nearest her with a greater degree of force than the does the centre of the earth, she will draw the water on the side more than she draws the centre, and so causes it to rise on that side: and as she draws the centre more than she draws the opposite side, the centre will recede farther from the surface of the water than the opposite side, and so leave it as high there as she raised it on the side next to her. For, as the centre will be in the middle between the tops of the opposite elevations, they must of course be equally high on both sides at the same time.

But upon this supposition the earth and moon would soon come together; and to be sure they would, if they had not a motion round their common centre of gravity, to create a degree of centrifugal force sufficient to balance their mutual attraction. This motion they have; for as the moon goes round her orbit every month, at
the distance of 240000 miles from the earth's centre, and
of 234000 miles from the centre of gravity of the earth
and moon, so does the earth go round the same centre of
gravity every month at the distance of 6000 miles from
it; that is, from it to the centre of the earth. Now as
the earth is (in round numbers) 8000 miles in diameter,
the distance of its side next the moon is 2000 miles.
Therefore the centrifugal forces of these parts are as
2000, 6000, and 10000; that is, the centrifugal force of
any side of the earth, when it is turned from the moon,
is five times as great as when it is turned towards the moon.
And as the moon's attraction (express'd by the number 6000) at
the earth's centre keeps the earth from flying out of this
monthly circle, it must be greater than the centrifugal
force of the waters on the side next her; and consequently,
her greater degree of attraction on that side is suffi-
cient to raise them; but as her attraction on the opposite
side is less than the centrifugal force of the water there,
the excess of this force is sufficient to raise the water juft as high on the opposite side.—To prove this ex-
perimentally, let the bar DC (fig. 10.) with its fur-
ture be fixed upon the whirling-board of the ma-
cine (fig. 2.) by pulling the pin P into the centre of
the board; which pin is in the centre of gravity of the
whole bar with its three balls e, f, and moon M.
Now, if the whirling-board and bar be turned slowly
round by the winch, until the ball f hangs over the
centre of the circle, as in fig. 11, the ball g will be kept
towards the moon by the heaviest weight p (fig. 9.)
and the ball e, on account of its greater centrifugal force,
and the lefser weight r, will fly off as far to the other side
as in fig. 12. And fo, whilst the machine is kept turn-
ing, the balls e and g will hang over the ends of the el-
lipsis t, r. So that the centrifugal force of the ball e will
exceed the moon's attraction j uft as much as her attrac-
tion exceeds the centrifugal force of the ball g, whilst
her attraction just balances the centrifugal force of the
ball f, and makes it keep in its circle. And hence it is
evident that the tides must rise to equal heights at the
fame time on opposite sides of the earth. This experi-
ment, to the belief of my knowledge, is entirely new.

From the principles thus established, it is evident that
the earth moves round the fun, and not the fun round the
earth: for the centrifugal law will never allow a great
body to move round a small one in any orbit whatever;
especially when we find, that if a small body moves round
a great one, the great one must also move round the
common centre of gravity between them two. And it is well
known, that the quantity of matter in the fun is 227000
times as great as the quantity of matter in the earth.
Now, as the fun's distance from the earth is at lea-
st 81,000,000 of miles, if we divide that distance by
227000, we shall have only 357 for the number of miles
that the centre of gravity between the sun and earth is
distant from the sun's centre. And as the fun's semidia-
meter is 4 of a degree, which, at so great a distance as
that of the sun, must be no lefs than 341500 miles, if
this be divided by 357, the quotient will be 10680,
which shews that the common centre of gravity is within
the body of the fun, and is only the 10680 part of his
semidiameter from his centre towards his surface.

All globular bodies, whose parts can yield, and which
do not turn on their axes, must be perfect spheres, be-
cause all parts of their surfaces are equally attracted to-
toward their centres. But all such globes which do turn
on their axes, will be oblate spheroids; that is, their
surfaces will be higher, or farther from the centre, in
the equatorial than in the polar regions. For, as the equa-
torial parts move quicker, they must have the great-
eſt centrifugal force; and will therefore recede farthest
from the axis of motion. Thus, if two circular hoops
AB and CD, (Plate CVII. fig. 1.) made thin and flex-
ible, and croffing one another at right angles, be turned
round their axis EF by means of the winch N, the wheel
n, and pinion n, and the axis be loose in the pole or in-
terference e, the middle parts A, B, C, D will fly the far
to strike against the fides of the frame at F and G, if
the pole e, in linking to the pin E, be not ftopt by it from
finking farther: fo that the whole will appear of an oval fi-
gure, the equatorial diameter being considerably longer than
the polar. That our earth is of this figure, is demon-
strable from actual measurement of some degrees on its
surface, which are found to be longer in the frigid zones
than in the torrid: and the difference is found to be
such as prove the earth's equatorial diameter to be 35
miles longer than its axis.—Since then, the earth is high-
er at the equator than at the poles, the sea, which like
all other fluids naturally runs downward (or towards the
places which are nearest the earth's centre) would run
towards the polar regions, and leave the equatorial parts
dry, if the centrifugal force of the water, which carries
it to those parts, and so raised them, did not detain and
keep it from running back again towards the poles of the
earth.

Of the Mechanical Powers.

If we confider bodies in motion, and compare them
together, we may do this either with respect to the quan-
tities of matter they contain, or the velocities with which
they are moved. The heavier any body is, the greater
is the power required either to move it or to flop its mo-
tion: and again, the fwtier it moves, the greater is its
force. So that the whole momentum or quantity of force
of a moving body is the refult of its quantity of matter
multiplied by the velocity with which it is moved. And
when the products arising from the multiplication of the
particular quantities of matter in any two bodies by their
respective velocities are equal, the momenta or entire
forces are fo too. Thus, fuppofe a body, which we fhall
call A, to weigh 40 pounds, and to move at the rate of
two miles in a minute; and another body, which we fhall
call B, to weigh only four pounds, and to move 20 miles
in a minute; the entire forces with which thefe two
bodies would strike against any obstacle would be equal
to each other, and therefore it would require equal powers
to ftop them. For 40 multiplied by 2 gives 80, the force
of the body A; and 20 multiplied by 4 gives 80, the
force of the body B.

Upon this cally principle depends the whole of me-
chanics...
M E C H A N I C S.

Mechanics: and it holds universally true, that when two bodies are suspended by any machine, so as to act contrary to each other; if the machine be put into motion, and the perpendicular ascent of one body multiplied into its weight, be equal to the perpendicular descent of the other body multiplied into its weight, these bodies, how unequal soever in their weights, will balance one another in all situations: for, as the whole ascent of one is performed in the same time with the whole descent of the other, their respective velocities must be directly as the spaces they move through; and the excess of weight in one body is compensated by the excess of velocity in the other.—Upon this principle it is easy to compute the power of any mechanical engine, whether simple or compound; for it is but only inquiring how much swifter the power moves than the weight does (i. e. how much farther in the same time,) and just so much is the power increased by the help of the engine.

In the theory of this science, we suppose all planes perfectly even, all bodies perfectly smooth, levers to have no weight, cords to be extremely pliable, machines to have no friction; and in short, all imperfections must be set aside until the theory be established, and then proper allowances are to be made.

The simple machines, usually called mechanical powers, are fix in number, viz. the lever, the wheel and axle, the pulley, the inclined plane, the wedge, and the screw. They are called mechanical powers, because they help us to raise weights, move heavy bodies, and overcome resistances, which we could not effect without them.

A lever is a bar of iron or wood, one part of which being supported by a prop, all the other parts turn upon that prop as their centre of motion: and the velocity of every part or point is directly as its distance from the prop. Therefore, when the weight to be raised at one end is to the power applied at the other to raise it, as the distance of the power from the prop is to the distance of the weight from the prop, the power and weight will exactly balance each other; and a little addition to the power will raise the weight. Thus, in the present instance, the weight \( W \) is 12 ounces, and its distance from the prop is 1 inch; and 12 multiplied by 1 is 12; the power \( P \) is equal to 1 ounce, and its distance from the prop is 1 inch; and 12 multiplied by 1 is 12; the power and weight will exactly balance each other; and a little addition to the power will raise the weight.

There are four kinds of levers. 1. The common fort, where the prop is placed between the weight and the power; but much nearer to the weight than to the power. 2. When the prop is at one end of the lever, the power at the other, and the weight between them. 3. When the prop is at one end, the weight at the other, and the power applied between them. 4. The bended lever, which differs only in form from the first sort, but not in property. Tho' of the first and second kind are often tided in mechanical engines; but there are few instances in which the third sort is used.

A common balance is a lever of the first kind; but as both its ends are at equal distances from its centre of motion, they move with equal velocities; and therefore, as it gives no mechanical advantage, it cannot properly be reckoned among the mechanical powers.

A lever of the first kind is represented by the bar ABC, (Plate CVII. fig. 2.) supported by the prop D. Its principal use is to loosen large stones in the ground, or raise great weights to small heights, in order to have ropes put under them for raising them higher by other machines. The parts AB and BC, on different sides of the prop D, are called the arms of the lever: the end A of the shorter arm AB being applied to the weight intended to be raised, or to the resistance to be overcome; and the power applied to the end C of the longer arm BC.

In making experiments with this machine, the shorter arm AB must be as much thicker than the longer arm BC, as will be sufficient to balance it on the prop. This supposed, let \( P \) represent a power whose intensity is equal to one ounce, and \( W \) a weight whose intensity is equal to 12 ounces. Then, if the power be 12 times as far from the prop as the weight is, they will exactly counterpoise; and a small addition to the power \( P \) will cause it to descend, and raise the weight \( W \); and the velocity with which the power descends will be to the velocity with which the weight rises, as 12 to 1; that is, directly as their distances from the prop; and consequently, as the spaces through which they move.

Hence it is plain, that a man who by his natural strength, without the help of any machine, could support an hundred weight, will by the help of this lever be enabled to support twelve hundred. If the weight be less, or the power greater, the prop may be placed so much the farther from the weight; and then it can be raised to a proportionably greater height. For universally, if the intensity of the weight multiplied into its distance from the prop be equal to the intensity of the power multiplied into its distance from the prop, the power and weight will exactly balance each other; and a little addition to the power will raise the weight. Thus, in the present instance, the weight \( W \) is 12 ounces, and its distance from the prop is 1 inch; and 12 multiplied by 1 is 12; the power \( P \) is equal to 1 ounce, and its distance from the prop is 12 inches, which multiplied by one is 12 again; and therefore there is an equilibrium between them. So, if a power equal to 2 ounces be applied at the distance of 6 inches from the prop, it will just balance the weight \( W \); for 6 multiplied by 2 is 12, as before. And a power equal to 3 ounces placed at 4 inches distance from the prop would do the same; for 3 times 4 is 12; and so on, in proportion.

The flatera, or Roman steadyard, is a lever of this kind, contrived for finding the weights of different bodies by one single weight placed at different distances from the prop or centre of motion \( D \). For, if a scale hangs at \( A \), the extremity of the shorter arm \( AB \), and is of such a weight as will exactly counterpoise the longer arm \( BC \); if this arm be divided into as many equal parts as it will contain, each equal to \( AB \), the single weight \( P \) (which we may suppose to be 1 pound) will serve for weighing any thing as heavy as itself, or as many times heavier as there are divisions in the arm \( BC \), or any quantity between its own weight and that quantity. As for example, if \( P \) be 1 pound, and placed at the first division 1 in the arm \( BC \), it will balance 1 pound in the scale at \( A \); if it be removed to the second division at 2, it will balance 2 pounds in the scale; if to the third, 3 pounds: and so on to the end of the arm \( BC \). If each of these integral divisions be subdivided into as many equal parts as a pound contains ounces, and the weight
To this kind of lever may be reduced several sorts of instruments, such as scissors, pinchers, snuffers; which are made of two levers acting contrary to one another; their prop or centre of motion being the pin which keeps them together.

In common practice, the longer arm of this lever greatly exceeds the weight of the shorter; which gains great advantage, because it adds so much to the power.

A lever of the second kind has the weight between the prop and the power. In this, as well as the former, the advantage gained is as the distance of the power from the prop to the distance of the weight from the prop: for the respective velocities of the power and weight are in that proportion; and they will balance each other when the intensity of the power multiplied by its distance from the prop is equal to the intensity of the weight multiplied by its distance from the prop. Thus, if AB (fig. 2.) be a lever on which the weight W of 6 ounces hangs at the distance of 1 inch from the prop G, and a power P equal to the weight of one ounce hangs at the end B, 6 inches from the prop, by the cord CD going over the fixed pulley E, the power will just support the weight; and a small addition to the power will raise the weight 1 inch for every 6 inches that the power defends.

This lever shews the reason why two men carrying a burden upon a neck between them, bear unequal shares of the burden in the inverse proportion of their distances from it. For it is well known, that the nearer any of them is to the burden, the greater share he bears of it; and if he goes directly under it, he bears the whole. So, if one man be at G, and the other at P, having the pole or neck AB resting on their shoulders; if the burden or weight W be placed five times as near the man at G, as it is to the man at P, the former will bear five times as much weight as the latter. This is likewise applicable to the case of two horses of unequal strength, to be fodder, as each horse may draw a part proportional to his strength; which is done by dividing the beam so, that the point of traction may be as much nearer to the stronger horse than to the weaker, as the strength of the former exceeds that of the latter.

To this kind of lever may be reduced oars, rudders of ships, doors turning upon hinges, cutting knives which are fixed at the point of the blade, and the like.

If in this lever we suppose the power and weight to change places, so that the power may be between the weight and the prop, it will become a lever of the third kind; in which, there may be a balance between the power and the weight, the intensity of the power must exceed the intensity of the weight, just as much as the distance of the weight from the prop exceeds the distance of the power from it. Thus, let E (fig. 4.) be the prop of the lever AB, and W a weight of 1 pound, placed 3 times as far from the prop, as the power P acts at F, by the cord DE going over the fixed pulley D; in this case, the power must be equal to three pounds, in order to support the weight.

To this sort of lever are generally referred the bones of a man's arm: for when we lift a weight by the hand, the muscle that exerts its force to raise that weight, is fixed to the bone about one tenth part as far below the elbow as the hand is. And the elbow being the centre round which the lower part of the arm turns, the muscle must therefore exert a force ten times as great as the weight that is raised.

As this kind of lever is a disadvantage to the moving power, it is never used but in cases of necessity; such as that of a ladder, which, being fixed at one end, is by the power of a man's arms reared against a wall; and in clock-work, where all the wheels may be reckoned levers of this kind, because the power that moves every wheel, except the first, acts upon it near the centre of motion by means of a small pinion, and the resistance it has to overcome acts against the teeth round its circumference.

The fourth kind of lever differs nothing from the first, but in being bended for the sake of convenience. ACB (fig. 5.) is a lever of this sort, bended at C, which is its prop, or centre of motion. P is a power acting upon the longer arm AC at F, by means of the cord DE going over the pulley G; and W is a weight or resistance acting upon the end B of the shorter arm BC. If the power be to the weight as BC is to CF, they are in equilibrium. Thus, suppose W to be 5 pounds acting at the distance of one foot from the centre of motion C, and P to be 1 pound acting at F, five feet from the centre C, the power and weight will just balance each other. A hammer drawing a nail is a lever of this sort.

2. The second mechanical power is the wheel and axle, in which the power is applied to the circumference of the wheel, and the weight is raised by a rope which coils about the axle as the wheel is turned round. Here it is plain, that the velocity of the power must be to the velocity of the weight, as the circumference of the wheel is to the circumference of the axle; and consequently, the power and weight will balance each other, when the intensity of the power is to the intensity of the weight as the circumference of the axe is to the circumference of the wheel. Let AB (fig. 6.) be a wheel, CD its axle, and suppose the circumference of the wheel to be 8 times as great as the circumference of the axle; then a power P equal to 1 pound hanging by the cord I, which goes round the wheel, will balance a weight W of 8 pounds hanging by the rope K which goes round the axle. And as the friction on the pivots or gudgeons of the axle is but small, a small addition to the power will cause it to descend, and raise the weight: but the weight will rise with only an eighth part of the velocity wherewith the power descends, and consequently through no more than an eighth part of an equal space, in the same time. If the wheel be pulled round by the handles S, S, the power will be increased in proportion to their length. And by this means, any weight may be raised as high as the operator pleases.

To this sort of engine belong all cranes for raising great weights; and in this case, the wheel may have cogs all around it instead of handles, and a small lantern or trundle may be made to work in the cogs, and be turned by
by a winch; which will make the power of the engine to exceed the power of the man who works it, as much as the number of revolutions of the winch exceed those of the axle D, when multiplied by the excess of the length of the winch above the length of the semidiameter of the axle, added to the semidiameter or half-thickness of the rope K, by which the weight is drawn up. Thus, suppose the diameter of the rope and axle taken together to be 12 inches, and consequently half their diameters to be 6 inches; so that the weight W will hang at 6 inches perpendicular distance from below the centre of the axle. Now, let us suppose the wheel AB, which is fixt on the axle, to have 80 cogs, and to be turned by means of a winch fix inches long, fixt on the axis of a trundle of 8 fixe or rounds, working in the cogs of the wheel. Here it is plain, that the winch and trundle would make 10 revolutions for one of the wheel AB, and its axis D, on which the rope K winds in raising the weight W; and the winch being no longer than the sum of the semi-diameters of the great axle and rope, the trundle could have no more power on the wheel, than a man could have by pulling it round by the edge, because the winch would have no greater velocity than the edge of the wheel has, which we here suppose to be ten times as great as the velocity of the rising weight; so that, in this case, the power gained would be as 10 to 1. But if the length of the winch be 12 inches, the power gained will be as 20 to 1: if 18 inches (which is long enough for any man to work by) the power gained would be as 30 to 1; that is, a man could raise 30 times as much by such an engine, as he could do by his natural strength without it, because the velocity of the handle of the winch would be 30 times as great as the velocity of the rising weight; the absolute force of any engine being in proportion of the velocity of the power to the velocity of the weight raised by it. But then, just as much power or advantage as is gained by the engine, so much time is lost in working it. In this sort of machines it is requisite to have a ratchet-wheel G on one end of the axle, with a catch H to fall into its teeth; which will at any time support the weight, and keep it from descending, if the workman should, through inadvertency or carelessness, quit his hold whilst the weight is raising. And by this means, the danger is prevented which might otherwise happen by the running down of the weight when left at liberty.

3. The third mechanical power or engine consists either of one moveable pulley, or a system of pulleys; some in a block or case which is fixed, and others in a block which is moveable, and rises with the weight. For the single pulley, that only turns on its axis, and rises not with the weight, may serve to change the direction of the power, yet it can give no mechanical advantage thereto; but is only as the beam of a balance, whose arms are of equal length and weight. Thus, if the equal weights W and P (fig. 7) hang by the cord BB upon the pulley A, whose block b is fixed to the beam HI, they will counterpoise each other, just in the same manner as if the cord were cut in the middle, and its two ends hung upon the hooks fixt in the pulley at A and A, equally distant from its centre.

But if a weight W hangs at the lower end of the moveable block p of the pulley D, and the cord GF goes under the pulley, it is plain that the half G of the cord bears one half of the weight W, and the half F the other; for they bear the whole between them. Therefore, whatever holds the upper end of either rope, sustains one half of the weight; and if the cord at P be drawn up so as to raise the pulley D to C, the cord will then be extended to its whole length, all but that part which goes under the pulley; and consequently, the power that draws the cord will have moved twice as far as the pulley D with its weight W rises: on which account, a power whose intensity is equal to one half of the weight will be able to support it, because if the power moves (by means of a small addition) its velocity will be double the velocity of the weight; as may be seen by putting the cord over the fixt pulley C (which only changes the direction of the power, without giving any advantage to it) and hanging on the weight P, which is equal only to one half of the weight W; in which case there will be an equilibrium, and a little addition to P will cause it to descend, and raise W through a space equal to one half of that through which P descends. Hence, the advantage gained will be always equal to twice the number of pulleys in the moveable or undermove block. So that, when the upper or fixt block u contains two pulleys, which only turn on their axes, and the lower or moveable block U contains two pulleys, which not only turn upon their axes, but also rise with the block and weight; the advantage gained by this is as 4 to the working power. Thus, if one end of the rope KMOQ be fixed to a hook at I, and the rope passes over the pulleys N and R, and under the pulleys L and P, and has a weight T, of one pound, hung to its other end at T, this weight will balance and support a weight W of four pounds hanging by a hook at the moveable block U, allowing the said block as a part of the weight. And if as much more power be added as is sufficient to overcome the friction of the pulleys, the power will descend with four times as much velocity as the weight rises, and consequently through four times as much space.

The two pulleys in the fixed block X, and the two in the moveable block Y, are in the same case with those last mentioned; and those in the lower block give the same advantage to the power.

As a system of pulleys has not great weight and lies in a small compass, it is easily carried about; and can be applied, in a great many cafes, for raising weights, where other engines cannot. But they have a great deal of exactitude, on three accounts: 1. Because the diameters of their axes bear a very considerable proportion to their own diameters; 2. Because in working they are apt to rub against one another, or against the sides of the block; 3. Because of the stiffness of the rope that goes over and under them.

4. The fourth mechanical power is the inclined plane; and the advantage gained by it is as great as its length exceeds its perpendicular height. Let AB (fig. 8.) be a plane parallel to the horizon, and CD a plane inclined to it; and suppose the whole length CD to be three times as great as the perpendicular height C/F: in this case, the cylinder E will be supported upon the plane CD, and kept...
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kept from rolling down upon it, by a power equal to a third part of the weight of the cylinder. Therefore, a weight may be rolled up this inclined plane with a third part of the power which would be sufficient to draw it up by the side of an upright wall. If the plane was four times as long as high, a fourth part of the power would be sufficient; and so on, in proportion. Or, if a pillar was to be raised from a floor to the height GF, by means of the engine ABDC, (which would then act as a half wedge, where the resistance gives way only on one side) the engine and pillar would be in *equilibrio*; and if the power applied at GF was to the weight of the pillar as GF to GD; and if the power be increased, so as to overcome the friction of the engine against the floor and pillar, the engine will be driven, and the pillar raised: and when the engine has moved its whole length upon the floor, the pillar will be raised to the whole height of the engine, from G to F.

The force wherewith a rolling body descends upon an inclined plane, is to the force of its absolute gravity, by which it would descend perpendicularly in a free space, as the height of the plane is to its length. For, suppose the plane AB (fig. 9.) to be parallel to the horizon, the cylinder C will keep at rest upon any part of the plane where it is laid. If the plane be so elevated, that its perpendicular height D (fig. 10.) is equal to half its length AB, the cylinder will roll down upon the plane with a force equal to half its weight; for it would require a power (acting on the direction of AB) equal to half its weight, to keep it from rolling. If the plane AB (fig. 11.) be elevated, so as to be perpendicular to the horizon, the cylinder C will descend with its whole force of gravity, because the plane contributes nothing to its support or hindrance; and therefore, it would require a power equal to its whole weight to keep it from descending.

Let the cylinder C (fig. 12.) be made to turn upon slender pivots in the frame D, in which there is a hook e, with a line G tied to it: let this line go over the fixed pulley H, and have its other end tied to a hook in the weight I. If the weight of the body I, be to the weight of the cylinder C, added to that of its frame D, as the perpendicular height of the plane LM is to its length AB, the weight will just support the cylinder upon the plane, and a small touch of a finger will either cancel it to ascend or descend with equal ease; then, if a little addition be made to the weight I, it will descend, and draw the cylinder up the plane. In the time that the cylinder moves from A to B, it will rise through the whole height of the plane ML; and the weight will descend from H to K, through a space equal to the whole length of the plane AB.

If the plane be made to move upon rollers or friction-wheels, and the cylinder be supported upon it; the same power will draw the plane under the cylinder, which before drew the cylinder up the plane, provided the pivots of the axes of the friction-wheels be small, and the wheels themselves be pretty large. For, let the machine ABC (fig. 13.) (equal in length and height to ABM, fig. 12.) be provided with four wheels, whereof two appear at D and E, and the third under C, whilst the fourth is hid from sight by the horizontal board a. Let the cylinder F be laid upon the lower end of the inclined plane CB, and the line G be extended from the frame of the cylinder, about six feet parallel to the plane CB; and, in that direction, fixed to a hook in the wall; which will support the cylinder, and keep it from rolling off the plane. Let one end of the line H be tied to a hook at C in the machine, and the other end to a weight K, the same as drew the cylinder up the plane before. If this line be put over the fixed pulley I, the weight K will draw the machine along the horizontal plane L, and under the cylinder F; and when the machine has been drawn the whole length CB, the cylinder will be raised to d, equal to the perpendicular height AB above the horizontal part a.

To the inclined plane may be reduced all hatchets, chisels, and other edge tools which are chamfered only on one side.

5. The fifth mechanical power or engine is the *wedge*, which may be considered as two equally inclined planes DEF and CEF, joined together at their bases e EF: then DC (Plate CVIII. fig. 1.) is the whole thickness of the wedge at its back ABCD, where the power is applied; EF is the depth or height of the wedge; DF the length of one of its sides, equal to CF the length of the other side; and OF is its sharp edge, which is entered into the wood intended to be split by the force of a hammer or mallet striking perpendicularly on its back. Thus, AB (fig. 2.) is a wedge driven into the cleft CDE of the wood FG.

When the wood does not cleave at any distance before the wedge, there will be an equilibrium between the power impelling the wedge downward, and the resistance of the wood acting against the two sides of the wedge; if the power be to the resistance, as half the thickness of the wedge at its back is to the length of either of its sides; or, as Aa to A6, or Ba to B6 (fig. 2.) And if the power be increased, so as to overcome the friction of the wedge and the resistance arising from the cohesion or stickage of the wood, the wedge will be driven in, and the wood split asunder.

But, when the wood cleaves at any distance before the wedge (as it generally does) the power impelling the wedge will not be to the resistance of the wood, as half the thickness of the wedge is to the length of one of its sides; but as half its thickness is to the length of either side of the cleft, estimated from the top or acting part of the wedge. For, if we suppose the wedge to be lengthened down from a to the bottom of the cleft at E, the fame proportion will hold; namely, that the power will be to the resistance, as half the thickness of the wedge is to the length of either of its sides: or, which amounts to the same thing, as the whole thickness of the wedge is to the length of both its sides.

In order to prove what is here advanced concerning the wedge, let us suppose the wedge to be divided lengthwise into two equal parts; and then it will become two equally inclined planes; one of which, as abc, (Plate CVII. fig. 14.) may be made use of as a half wedge for separating the moulding cd from the wainscot AB. It is evident, that when this half-wedge has been driven its whole length ac between the wainscot and moulding, its side ac will be at ed; and the moulding will be separated.
Some writers have advanced, that the power of the wedge is to the resistance to be overcome, as the thickness of the back of the wedge is to the length onl of one of its sides; which seems very strange: for, if we suppose AB (Plate CVIII. fig. 3.) to be a strong inflexible bar of wood or iron fixed into the ground at CB, and D and E to be two blocks of marble lying on the ground on opposite sides of the bar, it is evident that the block D may be separated from the bar to the distance $d$, equal to $ab$, by driving the inclined plane or half wedge $afo$ down between them; and the block E may be separated to an equal distance on the other side, in like manner, by the half wedge $edo$. But the power impelling each half wedge will be to the resistance of the block against its side, as the thickness of that half wedge is to the length of its acting side. Therefore the power to drive both the half wedges is to both the resistances, as both the half backs is to the length of both the acting sides, or as half the thickness of the whole back is to the length of either side. And, if the bar be taken away, the blocks put close together, and the two half wedges joined to make one; it will require as much force to drive it down between the blocks, as is equal to the sum of the separate powers acting upon the half wedges when the bar was between them.

To confirm this by an experiment, let two cylinders, as AB (fig. 4.) and CD, be drawn towards one another by lines running over fixed pulleys, and a weight of 40 ounces hanging at the lines belonging to each cylinder: and let a wedge of 40 ounces weight, having its back jut as thick as either of its sides is long, be put between the cylinders, which will then act against each side with a resistance equal to 40 ounces, whilst its own weight endeavours to bring it down and separate them. And here, the power of the wedge's gravity impelling it downward, will be to the resistance of both the cylinders against the wedge, as the thickness of the wedge is to the length of both its sides; for there will then be an equilibrium between the weight of the wedge and the resistance of the cylinders against it, and it will remain at any height between them; requiring just as much power to pull it upward as to pull it downward. —If another wedge of equal weight and depth with this, and only half as thick, be put between the cylinders, it will require twice as much weight to be hung at the ends of the lines which draw them together, to keep the wedge from going down between them. That is, a wedge of 40 ounces, whose back is only equal to half the length of one of its sides, will require 80 ounces to each cylinder, to keep it in an equilibrium between them: and twice 80 is 160, equal to four times 40. So that the power will be always to the resistance, as the thickness of the back of the wedge is to the length (not of its one side, but) of both its sides.

The best way, though perhaps not the neatest, for making a wedge with its appurtenances for such experiments, is as follows. Let IKLM (fig. 4.) and LMNO be two flat pieces of wood, each about fifteen inches long and three or four in breadth, joined together by a hinge at LM; and let P be a graduated arch of brass, on which the said pieces of wood may be opened to any angle not more than 60 degrees, and then fixed at the given angle by means of the two screws $a$ and $b$. Then, IKNO will represent the back of the wedge, LM its sharp edge which enters the wood, and the outsides of the pieces IKLM and LMNO the two sides of the wedge against which the wood acts in cleaving. By means of the said arch, the wedge may be opened so as to adjust the thicknesses of its back in any proportion to the length of either of its sides, but not to exceed that length: and any weight, as $p$, may be hung to the wedge upon the hook M, which weight, together with the weight of the wedge itself, may be considered as the impelling power; which is all the same in experiment, whether it be laid upon the back of the wedge to pulh it down, or hung to its edge to pull it down.

—Let AB and CD be two wooden cylinders, each about two inches thick, where they touch the outsides of the wedge; and let their ends be made like two round flat plates, to keep the wedge from slipping off endwise between them. Let a small cord with a loop on one end of it go over a pivot in the end of each cylinder, and the cords S and T belonging to the cylinder AB go over the first pulleys W and X, and be fastened at their other ends to the bar $wx$, on which any weight, as $Z$, may be hung at pleasure. In like manner, let the cords Q and R belonging to the cylinder BC go over the first pulleys U and V to the bar $uy$, on which a weight $Y$ equal to $Z$ may be hung. These weights, by drawing the cylinders towards one another, may be considered as the resistance of the wood acting equally against opposite sides of the wedge; the cylinders themselves being supported in parallel to each other, by their pivots in loops on the lines E,F,G,H; which lines may be fixed to hooks in the ceiling of the room. The longer these lines are, the better; and they should never be less than four feet each. The further also the pulleys $W,V$ and $W,X$ are from the cylinders, the truer will the experiments be; and they may turn upon pins fixed into the wall.

In this machine, the weights $Y$ and $Z$, and the weight $p$, may be varied at pleasure, so as to be adjusted in proportion...
portion of the length of the wedge's side to the thickness of its back; and when they are so adjusted, the wedge will be in equilibribo with the refittance of the cylinders.

The wedge is a very great mechanical power, since not only wood but even rocks can be split by it; which would be impossible to effect by the lever, wheel and axle, or pulley: for the force of the blow, or strokes, shakes the cohering parts, and thereby makes them separate the more easily.

6. The sixth and last mechanical power is the screw; which cannot properly be called a simple machine, because it is never used without the application of a lever or winch to assist in turning it: and then it becomes a compound engine of a very great force either in pressing the parts of bodies close together, or in raising great weights. It may be conceived to be made by cutting a piece of paper ABC (fig. 5.) into the form of an inclined plane or half wedge, and then coiling it round a cylinder AB (fig. 6.) And here it is evident, that the winch E must turn the cylinder once round before the weight or resistance D can be moved from one spiral winding to another, as from d to e: therefore, as much as the circumference of a circle described by the handle of the winch is greater than the interval or distance between the spirals, so much is the force of the screw. Thus, supposing the distance between the spirals to be half an inch, and the length of the winch to be twelve inches: the circle described by the handle of the winch where the power acts will be 76 inches nearly, or about 152 half inches, and consequently 152 times as great as the distance between the spirals: and therefore, a power at the handle, whose intensity is equal to no more than a single pound, will balance 152 pounds acting against the screw; and as much additional force, as is sufficient to overcome the friction, will raise the 152 pounds; and the velocity of the power will be to the velocity of the weight, as 152 to 1. Hence it appears, that the longer the winch be made, and the nearer the spirals are to one another, so much the greater is the force of the screw.

A machine for shewing the force or power of the screw may be contrived in the following manner. Let the wheel C (fig. 7.) have a screw ab on its axis, working in the teeth of the wheel D, which suppose to be 48 in number. It is plain, that for every time the wheel C and screw ab are turned round by the winch A, the wheel D will be moved one tooth by the screw; and therefore, in 48 revolutions of the winch, the wheel D will be turned once round. Then, if the circumference of a circle described by the handle of the winch be equal to the circumference of a groove e round the wheel D, the velocity of the handle will be 48 times as great as the velocity of any given point in the groove. Consequentially, if a line G (above number 48) goes round the groove e, and has a weight of 48 pounds hung to it below the pedestal EF, a power equal to one pound at the handle will balance and support the weight. To prove this by experiment, let the circumferences of the grooves of the wheels C and D be equal to one another; and then if a weight H of one pound be suspended by a line going round the groove of the wheel C, it will balance a weight of 48 pounds hanging by the line G; and a small addition to the weight H will cause it to descend, and so raise up the other weight.

If the line G, instead of going round the groove e of the wheel D, goes round its axle I; the power of the machine will be as much increased, as the circumference of the groove e exceeds the circumference of the axle: which, supposing it to be six times, then one pound at H will balance 6 times 48, or 288 pounds hung to the line on the axle: and hence the power or advantage of this machine will be as 288 to 1. That is to say, a man, who by his natural strength could lift a hundred weight, will be able to raise 288 hundred, or 14 2/3 ton weight by this engine.

But the following engine is still more powerful, on account of its having the addition of four pulleys: and in it we may look upon all the mechanical powers combined together, even if we take in the balance. For as the axis D (fig. 8.) of the bar AB is in its middle at C, it is plain that if equal weights are suspended upon any two pins equidistant from the axis C, they will counterpoise each other.—It becomes a lever by hanging a small weight P upon the pin n, and a weight as much heavier upon either of the pins b, c, d, e, or f, as is in proportion to the pins being so much nearer the axis. The wheel and axle FG is evident; so is the screw E, which takes in the inclined plane, and with it the half wedge. Part of a cord goes round the axle, the rest under the lower pulleys K, m, over the upper pulleys L, n, and then it is tied to a hook at m in the lower or moveable block, on which hangs the weight W.

In this machine, if the wheel F has 30 teeth, it will be turned once round in thirty revolutions of the bar AB, which is fixed on the axis D of the screw E: if the length of the bar is equal to twice the diameter of the wheel, the pins a and n at the ends of the bar will move 60 times as fast as the teeth of the wheel do: and consequently, one ounce at P will balance 60 ounces hung upon a tooth at q in the horizontal diameter of the wheel. Then, if the diameter of the wheel F is 10 times as great as the diameter of the axle G, the wheel will have 10 times the velocity of the axle; and therefore one ounce P at the end of the lever AC will balance 10 times 60 or 6000 ounces hung to the rope H which goes round the axle. Lastly, if four pulleys be added, they will make the velocity of the lower block K, and weight W, four times less than the velocity of the axle: and this being the last power in the machine, which is four times as great as that gained by the axle, it makes the whole power of the machine 4 times 600, or 2400. So that a man who could lift one hundred weight in his arms, by his natural strength, would be able to raise 2400 hundred weight by this engine.—But it is here as in all other mechanical cases; for the time lost is always as much as the power gained, because the velocity with which the power moves will ever exceed the velocity with which the weight rises, as much as the intensity of the weight exceeds the intensity of the power.

The friction of the screw itself is very considerable; and there are few compound engines, but what, upon account of the friction of the parts against one another,
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will require a third part of more power to work them when loaded, than what is sufficient to constitute a balance between the weight and the power.

Of Mills, Cranes, Wheel carriages, and the Engine for driving Piers.

As these machines are so universally useful, it would be ridiculous to make any apology for describing them.

In a common breast-mill, where the fall of water may be about ten feet, AA (Plate CVIII. fig. 9.) is the great wheel, which is generally about 17 or 18 feet in diameter, reckoned from the outermost edge of any float-board at a to that of its opposite float at b. To this wheel the water is conveyed through a channel; and so, falling upon the wheel, turns it round.

On the axis BB of this wheel, and within the millhouse, is a wheel D, about 8 or 9 feet diameter, having 61 cogs, which turn a trundle E containing ten upright flaves or rounds; and when these are the number of cogs and rounds, the trundle will make 6 3/12 revolutions for one revolution of the wheel.

The trundle is fixed upon a strong iron axis called the spindle, the lower end of which turns in a brass foot, fixt at F, in the horizontal beam ST called the bridge-tree; and the upper part of the spindle turns in a wooden bush fixt into the nether millstone which lies upon beams in the floor YY. The top part of the spindle above the bush is square, and goes into a square hole in a strong iron cross abed (see fig. 3.) called the rynd; under which, and close to the bush, is a round piece of thick leather upon the spindle, which it turns round at the same time as it does the rynd.

The rynd is let into grooves in the under surface of the running millstone G (fig. 2.) and so turns it round in the same time that the spindle E is turned round by the cog-wheel D. This millstone has a large hole quite through its middle, called the eye of the millstone. The upper millstone may be set as close to the under one, or nearer the millstones are to one another, the finer they grind the corn; and the more remote from one another, the coarser.

The upper millstone G is inclosed in a round box H, which does not touch it anywhere; and is about an inch distant from its edge all around. On the top of this box stands a frame for holding the hopper KK, to which is hung the shoe I by two lines fastened to the hind-part of it, fixed upon hooks in the hopper, and by one end of the crook Lffring K fastened to the fore-part of it at J; the other end being twisted round the pin L. As the pin is turned one way, the string draws up the shoe closer to the hopper, and so lessens the aperture between them; and as the pin is turned the other way, it lets down the shoe, and enlarges the aperture.

If the shoe be drawn up quite to the hopper, no corn can fall from the hopper into the mill; if it be let a little down, some will fall; and the quantity will be more or less, according as the shoe is more or less let down. For the hopper is open at bottom, and there is a hole in the bottom of the shoe, not directly under the bottom of the hopper, but forward towards the end i, over the middle of the eye of the millstone.

There is a square hole in the top of the spindle, in which is put the feeder e (fig. 10.) This feeder (as the spindle turns round) jogs the shoe three times in each revolution, and so causes the corn to run constantly down from the hopper, through the shoe, into the eye of the millstone, where it falls upon the top of the rynd, and is, by the motion of the rynd and the leather under it, thrown below the upper shoe, and ground between the upper and lower one. The violent motion of the stone creates a centrifugal force in the corn going round with it, by which means it gets farther and farther from the centre, as in a spiral, in every revolution, until it be thrown quite out; and, being then ground, it falls through a spout M, called the mill eye, into the trough N.

When the mill is fed too fast, the corn bears up the stone, and is ground too coarse; and besides, it clogs the mill so as to make it go too slow. When the mill is too slowly fed, it goes too fast, and the stones by their attrition are apt to strike fire against one another. Both which inconveniences are avoided by turning the pin L backwards or forwards, which draws up or lets down the shoe; and so regulates the feeding, as the miller sees convenient.

The heavier the running millstone is, and the greater the quantity of water that falls upon the wheel, so much the faster will the mill bear to be fed; and consequently so much the more it will grind. And on the contrary, the lighter the stone, and the less the quantity of water, so much slower must the feeding be. But when the stone is considerably worn, and become light, the mill must be fed slowly at any rate; otherwise the stone will be too much borne up by the corn under it, which will make the meal coarse.

The quantity of power required to turn a heavy millstone is but a very little more than what is sufficient to turn a light one: for as it is supported upon the spindle by the bridge-tree ST, and the end of the spindle that turns in the brass foot therein being but small, the odds arising from the weight is but very inconsiderable in its action against the power or force of the water. And besides, a heavy stone has the same advantage as a heavy fly; namely, that it regulates the motion much better than a light one.

In order to cut and grind the corn, both the upper and under millstones have channels or furrows cut into them, proceeding obliquely from the centre towards the circumference. And these furrows are each cut perpendicularly on one side and obliquely on the other into the stone, which
which gives each furrow a sharp edge, and in the two
stones they come, as it were, against one another like the
edges of a pair of scissors: and so cut the corn, to make
it grind the easier when it falls upon the places between
the furrows. These are cut the same way in both stones
when they lie upon their backs, which makes them run
cross ways to each other when the upper stone is inverted
by turning its furrowed surface towards that of the lower.
For, if the furrows of both stones lay the same way, a
great deal of the corn would be driven onward in the
lower furrows, and so come out from between the stones
without ever being cut.

When the furrows became blunt and shallow by wear-
ing, the running stone must be taken up, and both stones
new dress with a chisel and hammer. And every time
the stone is taken up, there must be some tallow put
round the spindle upon the bush, which will soon be melt-
ed by the heat that the spindle acquires from its turning
and rubbing against the bush, and so will get in betwixt
them: otherwise the bush would take fire in a very little
time.

The bush must embrace the spindle quite close, to pre-
vent any shake in the motion; which would make some
parts of the stones grate and fire against each other; whilst
other parts of them would be too far asunder, and by that
means spoil the meal in grinding.

Whenever the spindle wears the bush so as to begin to
shake in it, the stone must be taken up, and a chisel drove
into several parts of the bush; and when it is taken out,
wooden wedges must be driven into the holes; by which
means the bush will be made to embrace the spindle close
all around it again. In doing this, great care must be
taken to drive equal wedges into the bush on opposite sides
of the spindle; otherwise it will be thrown out of the per-
pendicular, and so hinder the upper stone from being set
parallel under the under one, which is absolutely nece-
ssary for making good work. When any accident of this kind
happens, the perpendicular position of the spindle must be
restored by adjusting the bridge-tree ST by proper wedges
put between it and the brayer QR.

It often happens, that the rynd is a little wrinkled in
laying down the upper stone upon it; or is made to sink
a little lower upon one side of the spindle than on the oth-
er; and this will cause one edge of the upper stone to
drag all around upon the other, whilst the opposite
guide will not touch. But this is easily set to rights,
by raising the stone a little with a lever, and putting bits
of paper, cards, or thin chips, betwixt the rynd and the
stone.

The diameter of the upper stone is generally about six
feet, the lower stone about an inch more: and the upper
stone when new contains about 24½ cubic feet, which
weighs somewhat more than 1900 pounds. A stone of
this diameter ought never to go more than 60 times
round in a minute; for if it turns faster, it will heat the
meal.

The grinding surface of the under stone is a little con-
 vex from the edge to the centre, and that of the upper
stone a little more concave; so that they are farther
from one another in the middle, and come gradually
nearer towards the edges. By this means, the corn at
its first entrance between the stones is only bruised: but
as it goes farther on towards the circumference or edge,
it is cut smaller and smaller; and at last finely ground
just before it comes out from between them.

The water-wheel must not be too large, for if it be,
its motion will be too slow; nor too little, for then it
will want power. And for a mill to be in perfection, the
floats of the wheel ought to move with a third part of the
velocity of the water, and the stone to turn round once in
a second of time.

Such a mill as this, with a fall of water about 7½ feet,
will require about 32 hogheads every minute to turn the
wheel with a third part of the velocity with which the
water falls, and to overcome the resistance arising from
the friction of the gears and attrition of the stones in grind-
ing the corn.

The greater fall the water has, the less quantity of it
will serve to turn the mill. The water is kept up in the
mill-dam, and let out by a sluice called the penstock,
when the mill is to go. When the penstock is drawn up
by means of a lever, it opens a passage through which the
water flows to the wheel: and when the mill is to be flopped,
the penstock is let down, which stops the water from fall-
ing upon the wheel.

A less quantity of water will turn an overflown-mill
(where the wheel has buckets instead of float boards)
than a breast-mill where the fall of the water seldom ex-
ceeds half the height AB of the wheel. So that, where
there is but a small quantity of water, and a fall great en-
ough for the wheel to lie under it, the bucket (or over-
flown) wheel is always used. But where there is a large
body of water, with a little fall, the breast or float-board
wheel must take place. Where the water runs only upon
a little declivity, it can act but slowly upon the under
part of the wheel at A: in which case the motion of the
wheel will be very slow: and therefore, the floats ought
to be very long, though not high, that a large body of
water may act upon them: so that what is wanting in ve-
locity may be made up in power; and then the cog-wheel
may have a greater number of cogs in proportion to the
rounds in the trundle, in order to give the millstone a suf-
cient degree of velocity.

They who have read what is said in the first section,
concerning the acceleration of bodies falling freely by the
power of gravity acting constantly and uniformly upon
them, may perhaps ask, Why should the motion of the
wheel be equable, and not accelerated, since the water
acts constantly and uniformly upon it? The plain an-
swer is, That the velocity of the wheel can never be so great
as the velocity of the water that turns it; for, if it should
become so great, the power of the water would be quite
loft upon the wheel, and then there would be no proper
force to overcome the friction of the gears and attrition of
the stones. Therefore, the velocity with which the wheel
begins to move, will increase no longer than till its momen-
tum or force is balanced by the resistance of the machine;
and then the wheel will go on with an equable motion.

[If the cog-wheel D be made about 18 inches diameter,
with 30 cogs, the trundle as small in proportion with 10
flaves, and the millstones each about two feet in diameter,
and the whole work be put into a strong frame of wood,
as represented in the figure, the engine will be a hand-mill for grinding corn or malt in private families. And then, it may be turned by a winch, instead of the wheel AA; the millstone making three revolutions for every one of the winch. If a heavy fly be put upon the axle B, near the winch, it will help to regulate the motion.

If the cogs of the wheel and rounds of the trundle could be put in as exactly as the teeth are cut in the wheels and pinions of a clock, then the trundle might divide the wheel exactly; that is to say, the trundle might make a given number of revolutions for one of the wheel, without a fraction. But as any exact number is not necessary in mill-work, and the cogs and rounds cannot be set so truly as to make all the intervals between them equal; a skilful millwright will always give the wheel what he calls a hunting cog; that is, one more than what will answer to an exact division of the wheel by the trundle. And then, as every cog comes to the trundle, it will take the next fluff or round behind the one which it took in the former revolution: and by that means, will wear all the parts of the cogs and rounds which work upon one another equally, and to equal distances from one another in a little time; and so make a true uniform motion throughout the whole work. Thus, in the above water-mill, the trundle has 10 flaves, and the wheel 61 cogs.

Sometimes, where there is a sufficient quantity of water, the cog-wheel AA (Plate CIX. fig. 1.) turns a large trundle BB, on whose axis C is fixed the horizontal wheel D, with cogs all round its edge, turning two trundles E and F at the same time; whose axes or spindles G and H turn two millstones I and K, upon the fixed flones L and M. And when there is not work for them both, either may be made to lie quiet, by taking out one of the flaves of its trundle, and turning the vacant place towards the cog-wheel D. And there may be a wheel fixt on the upper end of the great upright axle C for turning a couple of bolting-mills, and other work for drawing up the sacks, cleaning the corn, sharpening of tools, &c.

If, instead of the cog-wheel AA and trundle BB, horizontal levers be fixed into the axle C, below the wheel D; then, horses may be put to these levers for turning the mill; which is often done where water cannot be had for that purpose.

The working parts of a wind-mill differ very little from those of a water mill; only the former is turned by the action of the wind upon four fails, every one of which ought (as is generally believed) to make an angle of $\frac{54}{3}$ degrees with a plane perpendicular to the axis on which the arms are fixt for carrying them; it being demonstrable, that when the falls are set to such an angle, and the axis turned end-ways toward the wind, the wind has the greatest power upon the falls. But this angle answers only to the cafe of a vane or sail just beginning to move; for, when the vane has a certain degree of motion, it yields to the wind; and then that angle must be increased to give the wind its full effect.

Again, the increase of this angle should be different, according to the different velocities from the axis to the extremity of the vane. At the axis it should be $\frac{54}{3}$ degrees, and thence continually increase, giving the vane a twist, and so causing all the ribs of the vane to lie in different planes.

Lastly, these ribs ought to decrease in length from the axis to the extremity, giving the vane a curvilinear form; so that no part of the force of any one rib be spent upon the rest, but all move on independent of each other. All this is required to give the falls of a wind-mill their true form: and we see both the twist and the diminution of the ribs exemplified in the wings of birds.

It is almost incredible to think with what velocity the tips of the falls move when acted upon by a moderate gale of wind. We have several times counted the number of revolutions made by the falls in ten or fifteen minutes; and from the length of the arms from tip to tip, have computed, that if a hoop of that diameter was to run upon the ground with the same velocity that it would move if put upon the fall-arms, it would go upwards of 30 miles in an hour.

As the ends of the falls nearest the axis cannot move with the same velocity that the tips or farthest ends do, although the winds act equally strong upon them; perhaps a better position than that of stretching them along the arms directly from the centre of motion, might be to have them set perpendicularly across the farther ends of the arms, and there adjusted lengthwise to the proper angle. For, in that case, both ends of the falls would move with the same velocity; and being farther from the centre of motion, they would have so much the more power: and then, there would be no occasion for having them so large as they are generally made, which would render them lighter, and consequently there would be so much the less friction on the thick neck of the axle where it turns in the wall.

A crane is an engine by which great weights are raised to certain heights, or let down to certain depths. It consists of wheels, axles, pulleys, ropes, and a gib or gibbet. When the rope H (fig. 2.) is hooked to the weight K, a man turns the winch A, on the axis whereof is the trundle B, which turns the wheel C, on whose axis D is the trundle E, which turns the wheel F with its upright axis G, on which the great rope HH winds as the wheel turns; and going over a pulley I at the end of the arm d of the gib code, it draws up the heavy burden K, which being raised to a proper height, as from a ship to the quay, is then brought over the quay by pulling the wheel Z round by the handles z,z, which turns the gib by means of the half wheel b fixt on the gib-post cc, and the strong pinion a fixt on the axis of the wheel Z. This wheel gives the man that turns it an absolute command over the gib, so as to prevent it from taking any unlucky swing, such as often happens when it is only guided by a rope tied to its arm d; and people are frequently hurt, sometimes killed, by such accidents.

The great rope goes between two upright upright rollers i and k, which turn upon gudgeons in the fixed beams f and g: and as the gib is turned towards either side, the rope bends upon the roller next that side. Were it not for these rollers, the gib would be quite unmanageable; for the moment it was turned ever so little towards any side, the weight K would begin to descend, because the rope would be shortened between the pulley
I and axis $G$; and so the gib would be pulled violently to that side, and either be broken to pieces, or break every thing that came in its way. These rollers must be placed so, that the sides of them, round which the rope bends, may keep the middle of the bended part directly even with the centre of the hole in which the upper gudgeon of the gib turns in the beam $f$. The truer these rollers are placed, the easier the gib is managed, and the less apt to swing either way by the force of the weight $K$.

A ratchet-wheel $Q$ is fixed upon the axis $D$, near the trundle $E$; and unto this wheel falls the catch or click $R$. This hinders the machine from running back by the thickness of the rope $H$; the power of the crane would be as $24$ to $1$: but the radius of the wheel being double the above length, it doubles the said power, and so makes it as $48$ to $1$: in which case a man may raise $48$ times as much weight by this engine as he could do by his natural strength without it, making proper allowance for the friction of the working parts. — Two men may work at once, by having another winch on the opposite end of the axis of the trundle under $B$; and so make the power still double.

If this power be thought greater than what may be generally wanted, the wheels may be made with fewer cogs in proportion to the flaves in the trundles: and so the power may be of whatever degree is judged to be requisite. But if the weight be so great as will require yet more power to raise it (supposing a double quantity) then the rope $H$ may be put under a moveable pulley, as $F$, and the end of it tied to a hook in the gib at $a$; which will give a double power to the machine, and so raise a double weight hooked to the block of the moveable pulley.

When only small burdens are to be raised, this may be quickly done by men pushing the axle $G$ round by the hand-spokes $y, y, y$; having first disengaged the trundle $B$ from the wheel $C$: and then, this wheel will only act as a fly upon the wheel $F$; and the catch $R$ will prevent its running back, if the men should inadvertently leave off pushing before the burden be unhooked from $B$.

Lastly, when very heavy burdens are to be raised, which might endanger the breaking of the cogs in the wheel $F$; their force against these cogs may be much abated by men pushing round the hand-spokes $y, y, y$, whilst the man at $A$ turns the winch.

We have only shewn the working parts of this crane, without the whole of the beams which support them; knowing that these are easily suppos'd, and that if they had been drawn, they would have hid a great deal of the working parts from sight, and also confumed the figure.

Another very good crane is made in the following manner. $A$ (fig. 3.) is a great wheel turned by men walking within it at $H$. On the part $C$, of its axle $B$, the great rope $D$ is wound as the wheel turns; and this rope...
rope draws up goods in the same way as the rope HH does in the above-mentioned crane, the gib-work here being supposed to be of the same sort. But these cranes are very dangerous to the men in the wheel; for, if any of the men should chance to fall, the burden will make the wheel run back and throw them all about within it; which often breaks their limbs, and sometimes kills them. The late ingenious Mr Padmore of Bristol, whose contrivance the forementioned crane is, observing this dangerous construction, contrived a method for remedying it, by putting cogs all around the outside of the wheel, and applying a trundle E to turn it; which increases the power as much as the number of cogs in the wheel is greater than the number of flaves in the trundle: and by putting a ratchet-wheel F on the axis of the trundle, (as in the above-mentioned crane, with a catch to fall into it, the great wheel is swept from running back by the force of the weight, even if all the men in it should leave off walking. And by one man working at the winch I, or two men at the opposite winches when needful, the men in the wheel are much assisted, and much greater weights are raised, and could be by men only within the wheel. Mr. Padmore put also a grip-wheel G upon the axis of the trundle, which being pinched in the same manner as described in the former crane, heavy burdens may be let down without the leaf danger. And before this contrivance, the lowering of goods was always attended with the utmost danger to the men in the wheel; as every one must be sensible of, who has seen such engines at work.

And it is surprising that the makers of wharfs and cranes should be so regardless of the limbs, or even lives of their workmen, that, excepting the late Sir James Creed of Greenwich, and some gentlemen at Bristol, there is scarce an instance of any who has used this safe contrivance.

The structure of wheel-carriages is generally so well known, that it would be needless to describe them. And therefore, we shall only point out some inconveniences attending the common method of placing the wheels, and loading the waggon.

In coaches, and all other four-wheeled carriages, the fore wheels are made of a less size than the hind ones, both on account of turning short, and to avoid cutting the braces: otherwise, the carriage would go much easier if the fore-wheels were as high as the hind ones; and the higher the better, because their motion would be so much the flower on their axles, and consequently the friction proportionably taken off. But carriers and coachmen give another reason for making the fore-wheels much lower than the hind-wheels; namely, that when they are so, the hind-wheels help to push on the fore ones: which is too unphilosophical and absurd to deserve a refutation; and yet for their satisfaction, we shall shew by experiment that it has no existence but in their own imaginations.

It is plain, that the small wheels must turn as much oftener round than the great ones, as their circumferences are less. And therefore, when the carriage is loaded equally heavy on both axes, the fore-axle must endure as much more friction, and consequently wear out as much sooner, than the hind-axle, as the fore-wheels are less than the hind ones. But the great misfortune is, that all the carriers to a man do obstinately pull, against the clearest reason and demonstration, in putting the heavier part of the load upon the fore-axle of the waggon; which not only makes the friction greatest where it ought to be least, but also presteth the fore-wheels deeper into the ground than the hind wheels, notwithstanding the fore-wheels, being less than the hind ones, are with so much the greater difficulty drawn out of a hole or over an obdacle, even supposing the weights on their axles were equal. For the difficulty, with equal weights, will be as the depth of the hole or height of the obdacle is to the semidiameter of the wheel. Thus, if we suppose the small wheel D (fig. 4.) of the waggon AB to fall into a hole of the depth EF, which is equal to the semidiameter of the wheel, and the waggon to be drawn horizontally along; it is evident, that the point E of the small wheel will be drawn directly against the top of the hole; and therefore, all the power of horses and men will not be able to draw it out, unless the ground gives way before it. Whereas, if the hind wheel C falls into such a hole, it sinks not nearly so deep in proportion to its semidiameter; and therefore, the point G of the large wheel will not be drawn directly, but obliquely, against the top of the hole; and so will be easily got out of it. Add to this, that since a small wheel will often sink to the bottom of a hole, in which a great wheel will go but a very little way, the small wheels ought in all reason to be loaded with less weight than the great ones; and then the heavier part of the load would be less jolted and then the heavier part of the load would be thrown upon the hind-axle than upon the fore one, as the ground rises from a level below the carriage. But as this seldom happens, and when it does, a small temporary weight laid upon the pole between the horfes would overbalance the danger; and this weight might be thrown into the waggon when it comes to level ground; it is strange that an advantage so plain and so obvious would arise from loading the hind-wheels heaviest, should not be laid hold of; by complying with this method.

To confirm these reasonings by experiment, let a small model of a waggon be made, with its fore wheels 2½ inches in diameter, and its hind-wheels 4½; the whole model weighing about 20 ounces. Let this little carriage be loaded any how with weights, and have a small cord tied to each of its ends, equally high from the ground it relies upon; and let it be drawn along a horizontal board, first by a weight in a scale hung to the cord at the fore part; the cord going over a pulley at the end of the board to facilitate the draught, and the weight just sufficient to draw it along. Then, turn the carriage, and hang the scale and weight to the hind cord, and it will be
be found to move along with the same velocity as at first: which shews, that the power required to draw the carriage is all the same, whether the great or small wheels are foremost; and therefore the great wheels do not help in the least to push on the small wheels in the road.

Hang the scale to the fore cord, and place the forewheels (which are the small ones) in two holes, cut three eighth-pieces of an inch deep into the board; then put a weight of 32 ounces into the carriage, over the fore-axle, and an equal weight over the hind one: this done, put 44 ounces into the scale, which will be just sufficient to draw out the fore-wheels; but if this weight be taken out of the scale, and one of 16 ounces put into its place, if the hind-wheels are placed in the holes, the 16 ounces weight will draw them out; which is little more than a third part of what was necessary to draw out the fore-wheels. This shews, that the larger the wheels are, the less power will draw the carriage, especially on rough ground.

Put 64 ounces over the axle of the hind-wheels, and 32 over the axle of the fore ones, in the carriage; and place the fore wheels in the holes: then, put 38 ounces into the scale, which will just draw out the fore wheels; and when the hind ones come to the hole, they will find but very little resistance, because they sink but a little way in it.

But shift the weights in the carriage, by putting the 32 ounces upon the hind axle, and the 64 ounces upon the fore one; and place the fore wheels in the holes: then, if 76 ounces be put into the scale, it will be found no more than sufficient to draw out these wheels; which is double the power required to draw them out, when the lighter part of the load was put upon them: which is a plain demonstration of the absurdity of putting the heaviest part of the load in the fore part of the waggon.

Every one knows what an outcry was made by the generality, if not the whole body, of the carriers, against the broad-wheel act; and how hard it was to persuade them to comply with it, even though the government allowed them to draw with more horses, and carry greater loads, than usual. Their principal objection was, that as a broad wheel must touch the ground in a great many more points than a narrow wheel, the friction must of course be just so much the greater; and consequently, there must be so many more horses than usual, to draw the waggon. It is believed that the majority of people were of the same opinion, not considering, that if the whole weight of the waggon and load in it bears upon a great many points, the friction must be just so much the greater; and consequently, there must be so many more horses than usual, to draw the waggon. It is believed that the majority of people were of the same opinion, not considering, that if the whole weight of the waggon and load in it bears upon a great many points, each sustains a proportionately less degree of weight and friction, than when it bears only upon a few points; so that what is wanting in one, is made up in the other; and therefore will be just equal under equal degrees of weight, as may be shewn by the following plain and easy experiment.

Let one end of a piece of packthread be fastened to a brick, and the other end to a common scale for holding weights: then, having laid the brick edge-wise on a table, and let the scale hang under the edge of the table, put as much weight into the scale as will just draw the brick along the table. Then taking back the brick to its former place, lay it flat on the table, and leave it to be acted upon by the same weight in the scale as before, which will draw it along with the same ease as when it lay upon its edge. In the former case, the brick may be considered as a narrow wheel on the ground; and in the latter, as a broad wheel. And since the brick is drawn along with equal ease, whether its broad side or narrow edge touches the table, it shews that a broad wheel might be drawn along the ground with the same ease as a narrow one (supposing them equally heavy) even though they should drag, and not roll, as they go along.

As narrow wheels are always sinking into the ground, especially when the heaviest part of the load lies upon them, they must be considered as going constantly up hill, even on level ground; and their edges must sustain a great deal of friction by rubbing against the sides of the ruts made by them. But both these inconveniences are avoided by broad wheels; which, instead of cutting and ploughing up the roads, roll them smooth, and harden them; as experience testifies in places where they have been used, especially either on wet or sandy ground: though after all it must be confessed, that they will not do as well on clayey cross-roads; because they would soon gather up as much clay as would be almost equal to the weight of an ordinary load.

If the wheels were always to go upon smooth and level ground, the best way would be to make the spokes perpendicular to the naves; that is, to stand at right angles to the axes; because they would then bear the weight of the load perpendicularly, which is the strongest way for wood. But because the ground is generally uneven, one wheel often falls into a cavity or rut when the other does not; and then it bears much more of the weight than the other does: in which case, concave or dissolving wheels are best; because when one falls into a rut, and the other keeps upon high ground, the spokes become perpendicular in the rut, and therefore have the greatest strength when the obliquity of the load throws most of its weight upon them; whilst those on the high ground have less weight to bear, and therefore need not be at their full strength. So that the usual way of making the wheels concave is by much the better.

The axes of the wheels ought to be perfectly straight, that the rims of the wheels may be parallel to each other; for then they will move easiest, because they will be at liberty to go on straight forwards. But in the usual way of practice, the axes are bent downward at their ends, which brings the sides of the wheels next the ground nearer to one another than their opposite or higher sides are; and this not only makes the wheels to drag sidewise as they go along, and gives the load a much greater power of crushing them than when they are parallel to each other, but also endangers the overturning of the carriage when any wheel falls into a hole or rut; or when the carriage goes in a road which has one side lower than the other, as along the side of a hill. Thus (in the hind view of a waggon or cart) let AB and BF (fig. 5.) be the great wheels parallel to each other, on their straight axle K, and HCI the carriage loaded with heavy goods from C to G. Then, as the carriage goes on in the oblique road A-B, the centre of gravity of the whole machine and load will be at C (see p. 35. col. 1.) and the line
line of direction C/D falling within the wheel BF, the carriage will not overfet. But if the wheels be inclined to each other at the ground, as AE and BF (fig. 6) are, and the machine be loaded as before, from C to G, the line of direction C/D falls without the wheel BF, and the whole machine tumbles over. When it is loaded with heavy goods (such as lead or iron) which lie low, it may travel safely upon an oblique road fo long as the centre of gravity is at C, and the line of direction Cd (fig. 5) falls within the wheels; but if it be loaded high with lighter goods (such as woolpacks) from C to L, (fig. 7) the centre of gravity is raised from C to K, which throws the line of direction K/d without the lowest edge of the wheel BF, and then the load overfets the waggon.

If there be some advantage from small fore-wheels, on account of the carriage turning more easily and short than it can be made to do when they are large; there is at least as great a disadvantage attending them, which is, that as their axle is below the level of the horfes breasts, the horfes not only have the loaded carriage to draw along, but also part of its weight to bear; which tires them sooner, and makes them grow much fuffer in their hams; than they would be if they drew on a level with the fore axle; and for this reason, we find coach-horfit eons become unfit for riding. So that on all accounts it is plain, that the fore-wheels of all carriages ought to be fo high, as to have their axles even with the breasts of the horfes; which would not only give the horfes a fair draught, but likewise cause the machine to be drawn by a lefs degree of power.

MECHLIN, a large well built and fortified city of Brabant, twelve miles north east of Brufelss.

MECHOLACAN, a province of Mexico, bounded by Panama, on the north; by Mexico Proper, on the east; by the Pacific ocean, on the south; and by Guadalajara, or New Galicia, on the west.

MECKLENBURG DUCHY, a province of Germany, in the province of Lower Saxony, about 100 miles long, and 60 broad; bounded by the Baltic sea, on the north; by Pomerania, on the east; by Brandenburg, on the south; and by the duchies of Holstein, Lauenburg, and Lawenburg, on the west.

MECON, a great river, which rifes in the north of further India, and, running south through the kingdoms of Laos and Cambodia, falls into the Indian ocean.

MECONIUM, in medicine, a black thick fces gather'd in the intestines of infants, and brought with them into the world at the time of their birth.

MECONIUM, in pharmacy, the extract of English poppies.

Meconium has all the virtues of the foreign opium, but in a somewhat lower degree. See Opium.

MEDAL, a piece of metal in the form of coin, intending to convey to posterity the portrait of some great perfon, or the memory of some illustrious action. The parts of a medal are the two sides, one of which is called the face or head, and the other the reverse. On each side is the area, or field, which makes the middle of the medal; the rim, or border; and the exergue: and one of the two sides are distinguished the type or the figure represented, and the legend or inscription.

As to the antiquity of medals, the Greek are certainly the most ancient; for long before the building of Rome the Greeks had beautiful money in gold, silver, and copper. This plainly appears from several genuine medals of Macedon, older than Philip and Alexander; from Greek medals with the names of several magistrates prior to the Macedonian empire; to which we may add some Sicilian coins of still greater antiquity. As the Greek medals are the most beautiful, they have a design, accuracy, force, and delicacy, that expreses even the muscles and veins, and are struck with such exquisite art, as the Romans could never come up to. Those struck when Rome was governed by consuls, are the most ancient among the Romans; but the copper and silver medals do not go beyond the 48th year of Rome, nor the gold beyond the year 546. Among the imperial medals, we distinguish between the upper and lower empire: the first commenced under Julius Caesar, and ended A.D. about 260; the lower empire includes near 1200 years, and ends at the taking of Constantinople. It is the custom, however, to account all the imperial medals till the time of the Paleologi, among the antique; though we have none of any considerable beauty later than the time of Heraclius, who died in 641. The Gothic medals make part of the imperial ones. Modern medals are those struck within these 300 years. There are no true Hebrew medals, except a few shekels of copper and silver, but none of gold; though there is mention made of one in the king of Denmark's cabinet.

There was formerly no difference between money and medals. An old Roman had his purse full of the same pieces that we now preserve in cabinets. As soon as an emperor had done any thing remarkable, as gaining a victorv, giving up a tax, or the like, it was immediately stamped on a coin, and became current thro' his whole dominions. This was a pretty device to spread abroad the virtues of an emperor, and make his actions circulate; and thus a fresh coin was a kind of gazette, that published the latest news of the empire.

Several of our modern coins have the legend round the edges: but the ancients were too wise to register their exploits on so nice a surface. As to the figures upon medals, the Romans always appear in the proper drags of their country, so that we may observe the little variations of the mode in the drapery of the medal: they would have thought it ridiculous to have drawn an emperor of Rome in a Grecian cloak or a Phyrgian mitre. On the contrary, we often see a king of England or France dressed up like a Julius Caesar, as if they had a mind to pass themselves upon posterity for Roman
of Roman emperors. Nothing is more usual than to see allusions to Roman customs and ceremonies on the medals of our own nation; nay, they very often carry the figure of an heathen god. If posterity take its notions of us from our medals, they must fancy that one of our kings paid a great devotion to Minerva, another to Apollo, &c. or, at least, that our whole religion was a mixture of paganism and Christianity. Had the old Romans been guilty of the same extravagance, there would have been no great confusion in their antiquities, that their coins would not have had half the use we now find in them.

The use of medals is very considerable: they give a very great light into history, in confirming such passages as are true in old authors, in reconciling such as are told in different manners, and in recording such as have been omitted. In this case a cabinet of medals is a body of history. It was, indeed, the best way in the world to perpetuate the memory of great actions, thus to coin out the life of an emperor, and to put every exploit into the mint. It was a kind of printing before the art was invented; and they have this advantage over books, that they tell their story quicker, and sum up a whole volume in twenty or thirty reverses: thus Mr Vaillant, out of a small collection of medals, has given us a chronicle of the kings of Syria. They are indeed the best epitomes in the world, and let us see, with one cast of the eye, the substance of above an hundred pages. Another use of medals is, that they not only shew the actions of an emperor, but at the same time mark out the year in which they were performed; for as every exploit has its date set to it, a series of an emperor's coins is his whole life digested into annals. A medallist, upon the first naming of an emperor, will immediately tell his age, family, and life. To remember where he enters in the succession, he only considers in what part of the cabinet he lies; and by running over in his thoughts such a particular drawer, will give an account of all the remarkable parts of his reign. Nor are medals of less use in architecture, painting, poetry, &c. A cabinet of medals is a collection of pictures in miniature, and by them the plans of many of the most considerable buildings of antiquity are preferred.

Impreffions of Medals. A very easy and elegant way of taking the impressions of medals and coins, not generally known, is thus directed by Dr Shaw: Melt a little flingglasa-glue made with brandy, and pour it thinly over the medals, so as to cover its whole surface: let it remain on for a day or two, till it is thoroughly dry and hardened; and then taking it off, it will be fine, clear, and hard, as a piece of Moscovy glass, and will have a very elegant impression of the coin.

Another easy method is as follows: Take a perfect and sharp impression, in the finest black sealing-wax, of the coin or medal you desire. Cut away the wax round the edges of the impression; then with a preparation of gum-water, of the colour you would have the picture, spread the paint upon the wax-impression with a small hair pencil, observing to work it into all the sinking or hollow places, these being the rising parts of the medal; and the colour must be carefully taken from the other parts with a wet finger. Then take a piece of very thin poll-paper, a little larger than the medal, and moisten it quite through. Place it on the wax impression; and on the back of the paper lay three or four pieces of thick woolen cloth or flannel, of about the same size. The impression, with its coverings, should be placed between two smooth iron plates, about two inches square, and one tenth of an inch thick. These must be carefully put into a small press, made of two plates of iron, about five inches and a half long, one inch and a half wide, and half an inch in thickness, having a couple of long male-screws running through them, with a turning female-screw on each, to force the plates together. These being brought together, by means of the screws, will take off a true and fair picture of the medal; which, if any deficiencies should appear, may easily be repaired with a hair pencil, or pen, dipped in the colour made use of.

If a relievo only be desired, nothing is necessary, but to take a piece of card, or white paste-board, well soaked in water; then placing it on the wax-mould, without any colouring, and letting it remain in the press for a few minutes, a good figure will be obtained.

This method of taking off medals, &c. is convenient, and seems much more so than the several inventions usually practised in sulphur, plaster of Paris, paper, &c. wherein a mould must be formed, either of clay, horn, plaster, or other materials, which requires a good deal of time and trouble.

Medallion, or Medalion, a medal of an extraordinary size, supposed to be anciently struck by the emperors for their friends, and for foreign princes and embassadors; but that the smallness of their number might not endanger the loss of the devices they bore, the Romans generally took care to stamp the subject of them upon their ordinary coins.

Medallions, in respect of the other coins, were the same as modern medals in respect of modern money; they were exempted from all commerce, and had no other value but what was set upon them by the fancy of the owner. Medallions are so scarce that there cannot be any set made of them, even though the metals and fizes should be joined promiscuously.

Medelpadia, a small province of Sweden lying northward of Helsingia.

Medeola, in botany, a genus of the hexandria figyza clafs. It has no calix: the corolla consists of six revoluted segments; and the berry contains three seeds. There are two species, none of them natives of Britain.

Media, in geography, the ancient name of Gilan. See Gilan.


Mediastinum, in anatomy. See Anatomy, p. 278.

Mediate, or Intermediate, something that stands between and connects two or more terms, considered...
as extremes; in which sense it is opposed to immediate.
MEDICAGO, in botany, a genus of the diadelphia de-
candria class. The pod is compressed; and the cari-
na of the corolla declines from the vexillum. There
are nine species, four of them natives of Britain, viz.
The falcata, or yellow medic; the fativa, or lucern; the
Ipulina, or melilot trefoil; and the arabica, or heart-
trefoil.

MEDICINE.

MEDICINE is generally defined to be, The art of
preserving health when present, and of restoring it
when lost.

Men would never think of any particular regimen or
mode of living in order to preserve health, before they
felt the pains which accompany the want it. The first
painful sensation must necessarily have produced a desire
for relief. But in a period when physicians and medici-
ners were equally unknown, how was that relief to be
obtained? or what system of conduct would man in this
situation naturally follow? Whoever can answer these
questions, will unfold the genuine principles of the medi-
cal art, and give an infallible standard for judging what
progress has been made in the improvement of it, what
particular circumstances have contributed to obstruct or
forward the knowledge and cure of diseases.

Medicine being thus founded on a powerful instinct in
human nature, its existence in some form must have been
to the first disease that appeared among mankind.
Most arts require the experience of ages before they can
arrive at a high degree of perfection. Medicine is un-
questionably one of the most ancient; and consequently,
the improvement of it might be expected to bear some
proportion to its antiquity. But, whilst philosophy, in
all its branches, has been cultivated and improved to a
great extent; medicine, notwithstanding the collateral ad-
vantages it has of late derived from anatomy and other
sciences, still continues to be buried in rubbish and obscu-

Many causes have contributed to retard our progres in
the knowledge of the causes and cure of diseases. In the
early ages, prescriptions were either the result of tradition
founded upon uncertain facts, or mere random trials
without any rational view of success: Accordingly, when
any uncommon cafe occurred, the patients were placed in
cross-ways, and other public places, to receive the advice
of passengers who might chance to know the disease or an
efficacious remedy. In this way valuable medicines might
be accidentally discovered. But memory, and, in remark-
able cures, engravings on pillars or the walls of temples,
were poor instruments for recording the symptoms of dif-
causes, and the ingredients of prescriptions.

After the knowledge of medicine began to be studied
and practised as a liberal profession, a jealousy of reputa-
tion, joined to a thirst for money and ignorance of phi-

osophy, laid a solid foundation for medical disputa-
tion. One party of physicians, known by the name of Em-

pyreics, excluded all reasoning, and trusted solely to expe-
tience. Another party, called Dogmatists, maintained, that

no man ought to prescribe, without being able to give a

theory both of the disease and of the nature and action of
the medicine. This dispute continued for ages, and, like
other disputes of a similar nature, remains still in some
measure undecided. The principles of both these parties
are unquestionably good. But the physician who excludes
either of them, will make but little progress in the knowl-
edge of his profession. A judicious mixture of the two
is indispensably necessary. Indeed it is difficult to deter-
mine whether too great an attachment to empiricism or
dogmatism has contributed most to obstruct the improve-
ment of physic.

But there is one cause which has operated more power-
fully in preventing the improvement of medicine than ev-
even a combination of all the other causes. Most branches
of philosophy are principally cultivated by people who ex-
pect their reward in reputation, not in money. The prac-
tice of physic is become as literally a trade as any branch
of business whatever. Young men are taught physic with
no other view than that of gaining their bread. Whener-
ever a physician gets into extensive practice, he may
bully and make a noise; but, even supposing his abilities
to be great, he can never find leisure to think, or digest
his observations.

Another cause of the imperfect state of medicine arises
from the varieties in constitutions, and the complex na-
ture of diseases. It is even extremely difficult, after a
disease has been cured, to determine with certainty, whe-
ther the cure was performed by the operation of nature,
or by any particular virtue in the medicine. This diffi-
culty is greatly increased by the variety of different medicines,
and different ingredients in the same medicine, which are
commonly administered during the course of a disease.

Of late several attempts have been made to reduce me-
dicine into the form of a regular science, by distributing
diseases into classes, orders, genera, and species. Sau-
vage was the first, and indeed the only person who ever at-
tempted to complete this great work. Others, as Lin-
naeus, Vogel, Dr Cullen &c. have since endeavoured to
improve Sauvage's method of classing; but they have con-
tented themselves with an enumeration of the characters
and arrangement of the different genera, without enter-
ing into their history or cure. Sauvage enumerates 315
genera, Linnæus 325, Vogel 560, and Dr Cullen has re-
duced them to 132. The bare inspection of these num-
bers shows, that physicians are far from being agreed with
regard to what constitutes the generic or specific charac-
ters of a disease. Indeed we may venture to affirm, that
they never will agree upon this point: The diagnostic
symptoms of diseases are not so easily discovered as the fla-
mina or petals in a flower, or the number of teeth or toes

in
in a quadruped. However, before making any observations on the advantages or disadvantages that may probably result from the classification of diseases, we shall lay before our readers the last and shortest distribution, published last year by Dr. Cullen, one of the professors of medicine in the university of Edinburgh, under the title [Sympathetic Method, or rather, Genera Morborum Præcipuæ.]

The doctor divides diseases into the four following classes, viz.

**Class I. Pyrexia, or Feverish Disorders.**

**Class II. Neuroses, or Nervous Diseases.**

**Class III. Cachexia, or Diseases comprehending such disorders as proceed from a diseased state of the whole or any part of the body, without an original fever, or any nervous complaint.**

**Class IV. Locales; comprehending diseases which affect a part only, not the whole body.**

The first class (Pyrexia) is subdivided into five orders, viz.

**Order I. Fevers, or Fevers, is subdivided into three sections, viz.**

1. Intermittent; and, 2. Continued fevers.

**Order II. Phlegmasia, or fevers accompanied with any local pain.**


**Order III. Exanthemata, or diseases accompanied with a flux of blood, not proceeding from any local pain.**


The fourth class (Locales, or diseases affecting only a part of the body,) is subdivided into seven orders, viz.

**Order I. Dysthesia, or diseases arising from any of the senses being destroyed or impaired by a fault in the external organs of sensation.** There are 8 genera in this order, viz. 1. Caligo; 2. Amblyopia; 3. Dysecece; 4. Paracusis; 5. Anomia; 6. Amentia; 7. Anæsthesia; 8. Anaphrodisia.

**Order II. Dyscinesia, or diseases attended with the destruction or defect of motion in any part through a fault of the organs.** This order contains 6 genera, viz. 1. Aphonia; 2. Mutitas; 3. Paraphonia; 4. Pelliophora; 5. Strobilus; 6. Contraction.

**Order III. Apopleneses, or diseases attended with an increased flux of the blood or other humours, without a fever, or increased motion of the fluids.** This order contains 5 genera, viz. 1. Profusio; 2. Epiphora; 3. Peltorrhoeas; 4. Enuresis; 5. Gonorrhoea.

**Order IV. Episcenses, or diseases arising from suppression or obstruction of any usual excretions.** This order contains 3 genera, viz. 1. Oblipitio; 2. Ichthia; 3. Amenorrhœa.


**Order VI. Exoplia, comprehending diseases arising from...**
fing from any part's being removed from its proper situation, and causing a tumor. This order contains 3. genera, viz. 1. Hernia; 2. Prolapsus; 3. Luxatio.


It is needless to enter into an examination of the propriety or impropriety of this or any of the other modes of distribution. Every one of them are defective in many particulars. Sauvage, Vogel, Linnaeus, Dr Cullen, have each adopted peculiar theories of particular diseases. These theories constitute the basis of their different classifications. A person, therefore, who is not previously acquainted with these theories will naturally be surprised to find some diseases arranged under certain classes and orders. For example, who would expect to find a diarrhoea ranked under the class of Neuroses, and in the order of the other methods, but that particular one which he has been taught to believe as infallible.

However, notwithstanding these defects arising from the theoretical distribution of diseases, we cannot hesitate a moment in preferring even a bad method of classing to the theoretical distribution of diseases, we cannot hesitate a moment in preferring even a bad method of classing to the theoretical distribution of diseases, we cannot hesitate a moment in preferring even a bad method of classing to the theoretical distribution of diseases, we cannot hesitate a moment in preferring even a bad method of classing to the theoretical distribution of diseases, we cannot hesitate a moment in preferring even a bad method of classing to the theoretical distribution of diseases, we cannot hesitate a moment in preferring even a bad method of classing to the theoretical distribution of diseases, we cannot hesitate a moment in preferring even a bad method of classing to the theoretical distribution of diseases, we cannot hesitate a moment in preferring even a bad method of classing to the theoretical distribution of diseases, we cannot hesitate a moment in preferring even a bad method of classing to

The formal or fundamental cause of a fever consists in the spasmatic affection of the whole nervous and fibrous genus. This plainly appears from the usual phenomena of a fever, viz: a pain in the back, more particularly about the loins; a coldness, especially of the extreme parts; a shrunken, dry skin; a yawning; a stretching; a pale, livid countenance; a trembling and palpitating motion of the heart; an anxiety of the mind, difficult breathing, inquietude, restlessness; a sensation of an ebullition of the blood about the heart; a contracted, weak, small pulse; a naufea, and an inclination to vomit; a suppression of perspiration; colic in the bowels, with thin watery urine.

Hence it naturally follows, that whatever has a power to irritate and solicit the nervous and vascular system to spasms, is most likely to generate a fever. To this class belong violent passions of the mind, especially terror and anger; a poisonous, subtile, caustic matter, either bred within the body, or received by infection; a foppage of perspiration; a suppression of the sweat; eruptions driven back; an abundance of purulent ulcerous matter adhering to various parts; aliments too acrid and sharp; corrupt and bilious crudities lodged in the prime viscére; excessive watching; a violent pain and tension of the nervous parts; inflammations, tumours, and abscesses; hurting the nervous parts by sharp instruments; acrid and corrosive drugs; cold baths, and, on the contrary, those that are too hot or astringent.

According to the different nature of these causes, and the various manner of affecting the nerves, arise fevers of divers kinds. Some are benign, others malignant; some are intermittent, others continual; some are simple, others compound; others regular or anomalous; eruptive, spotted, putrid, hectic, or流程。Some admit, of an easy cure, others a difficult; some are protracted a long time; and many hurry the patient suddenly out of the world.

Yet, every frequent fyslole of the heart and arteries discoverable by the pulse ought not to be called a fever. For these may often arise from violent bodily exercise; or, from a commotion in the blood caused by hot and spirituous liquors. That only which arises from internal causes, and is preceded by shivering, shaking, and coldness.
nefts of the extreme parts, is properly a fever: For there is always, as it were, a double motion in a fever; the one from the circumference to the centre, or from the external parts to the internal, the heart and lungs; the other from the centre to the circumference. The first motion is attended with a small, contracted, weak, pulse, with an anxiety of the praecordia and difficulty of breathing; the second with an increased motion of the arteries, a large pulse, and heat extended even to the extreme parts.

The cause of the febrile motion is an universal ipasm; and that motion never ceases till the ipasm is resolved. The signs of its being resolved are, a free perspiration, and a breathing sweat; the pulse, which before was hard, impetuous, and quick, becomes soft, moderate, and slow; the urine lets fall a sediment, and the strength gradually returns. When these appear all together, they declare the solution of the disease, and are called the crisis.

Of Intermittent Fevers, or Agues.

This fever is of the regular kind, and is attended with the following symptoms. At first, the head aches, the limbs seem weary; there is a pain in the loins about the first vertebra of the back, which ascends towards the epigastrium, with a painful sense of a tension in the hypochondria, and costiveness: then comes on a coldness of the external parts, especially of the nose and ears; a stretching, yawning; a shivering and shaking, sometimes even to make the bed tremble under the patient; the pulse is small, contracted, and weak: again the patient is troubled with thirst; then follows a nausea, with a fruitful reaching to vomit; again, a pituitous, bilious, or green matter is brought up, commonly joined with a green matter is brought up, commonly joined with a dryness of the mouth, a lightness of the head, a disturbance of the senses, and anxiety about the praecordia. These symptoms continue about two or three hours. In some there is a nausea or vomiting, with a continuance of the fit. The fits sometimes come on in the morning, sometimes in the afternoon, in the evening, or at midnight. The paroxysm is sometimes longer, sometimes shorter; the urine lets fall no sediment within the time of remission or intermission; the sweating is either too sparing or too profuse. The pulse is often on all the other symptoms may appear; as, a looseness, a bleeding at the nose, fickness at the stomach, a violent headache, pain in the belly, or the groans. These symptoms are generally Epidemic, and most commonly appear in the summer and autumn.

Sometimes a tertian ague is double, which may be distinguished from a quotidian, by the time of the fits, which is not the same every day, but every other day.

There is sometimes a Continual Tertian, which begins with shivering and shaking, an anxiety, vomiting, loss of strength, and then a violent heat. The fits do not intermit, but only remit. The pulse continues frequent with heat and debility, and all the symptoms return with fresh vigour every other day; but at length admit a perfect intermission.

An Endemic Tertian is proper to certain places; as a low situation, and full of marshes, producing a great number of gnats and other insects, like some parts of Kent, and the hundreds of Essex. In such places, the natives themselves have a little of it every year; and strangers seldom or never escape, without a preservative, which is only the bark infused in brandy, with a little flax root, of which two ounces night and morning are to be taken.

A Quartan Ague has two fits in four days, or two days quite free from a fit. It begins about four or five in the afternoon, sometimes sooner and sometimes later, with a great latitude, stretching, a blunt pain in the head, back, loins and legs; the feet and hands are cold; the whole body is pale; the face and nails livid, to which shivering and shaking succeed. The tongue and the lips tremble, the breathing is difficult, with restlessness and tolling; the pulse is contracted and hard, and sometimes unequal; and there is an anxiety about the praecordia. These symptoms continue about two or three hours. In some the body is cold; in others there is a stimulus to stool, and to make water. In some there is a nausea or vomiting, with stools. Some advanced in years have their minds pretty much disturbed; the heat comes on gradually, not burning but dry; the pulse becomes equal, full, and quick; but the dull pain in the head remains, with a vertiginous affection: the skin becomes only a little moist; and in about four or six hours the symptoms vanish, except a dull pain in the bones, joints and feet. The urine in the fit is sometimes thin and watery, sometimes thick and with a sediment.

Sometimes a quartan ague is double, that is, when the fits come on every other day at different hours; and it is Spurious when a paroxysm begins at any other time of the day but that above-mentioned. It is said to be Continual, when on the intercalary days there are shiverings and pandonculations, with a greater heat than usual, a quicker pulse, a want of appetite, a debility, a dryness of the mouth, a lightness of the head, a disturbed.
ed sleep, and a reddish urine, with a thick rose-coloured sediment.

A QUOTIDIAN AGUE or fever returns every day, and is not so common as the tertian or quartan.

The accession of this fever is about four or five in the morning, with cold and shivering; to which succeeds a cardialgic nausea, and inflation of the belly; in some, a pain in the head; in others, fainting fits; in most, vomiting or fifts, or both. Then comes on a moderate heat, with thirst, but not very intense. The pulse, which was before irregular and weak, becomes more quick, but not very hard. The urine is not of a flame but rather of a citron colour, and turbid. Some are exceeding sleepy. At length a moderate sleep supervenes; and in about ten hours or longer, the fit goes off, leaving the body dull and heavy.

From these symptoms it appears, that the whole nervous system is agitated and suffers greatly by spastic constrictions; which proceeding chiefly from the medulla spinalis, affect preternaturally not only the coats of the vessels, but all the fibres throughout the body, thereby greatly disturbing the motion both of the solids and fluids.

The material cause of this, and all other fevers, according to Hoffman, is a fluid of an astive nature, emitted chiefly in the bile ducts and flexures of the duodenum; where the vitiated, bilious salivary and pancreatic juices meeting with the crudities of a bad digestion, ferment together, and, not being timely expelled, become virulent. This matter passing through the lacteals, into the blood, and thence into the nervous parts of the head, medulla spinalis, intestines, and stomach, as also to the nervous coats of the excretory and secretory vessels, excites an universal spasm, which first forces the blood to the interior and greater vessels; and afterwards the sphygmal motion of the heart and arteries being increased, the motion of the whole mass of blood and humours is accelerated, and the obstructions of the small vessels of the nervous parts are opened; upon which the spasm ceasing, the excretory ducts are relaxed, the fibrillar matter passes off through the pores of the skin by perspiration or sweat, and the fit ceases, till by the generation of fresh matter a new paroxysm is brought on.

As to the cure, when a load of vitiated humours in the stomach and duodenum require depletion, which is known from having indulged in too plentiful eating, from an anxiety of the precordia, from eruptions, and a bitter taste in the mouth, a vomit, after the first fit, in the time of intermission, is to be given. In tender constitutions, 10 grains of ipecacuanha may be given at a time, 3 grains of salt of wormwood, a scruple; 4 ounces of fennel water. Mix them together for a drink. Let the patient take it just as the fit comes on, and be well covered with bed-cloaths.

Bleeding is proper only in a hot season, when the heat of the patient is excessive, attended with a delirium, and in the prime of life, full of blood, and subject to passion. Opiates will appease the symptoms; but they disturb the crisis, and protract the disease. Likewise aluminous, chalybeates, and vitriolic remedies will stop the fits; and if they are given to patients of the lowest class, care must be taken that they sweat after them, by drinking hot decoctions, or by exercise.

Absorents have often a happy effect in these diseases; but if given in too great a quantity, they will not dissolve in the stomach. Harris advises 2 scruples of the simple powder of crabs claws, two hours before the fit, and to be repeated in an hour, in mint-water; no small beer is to be drank for eight hours after. It may be repeated in the same manner against the next time the fit is expected; as likewise a third time.

Langeilh afferts, that in long continued agues or intermitting fevers, which have baffled the bark and many other medicines, he has met with more advantage from rhubarb and calomel exhibited in small doses, than from anything else he had tried.

To prevent the return of an ague, the bark must be repeated every week or ten days, for three several times, with the same intervals. Likewise bitters and chalybeates are very serviceable for the same purpose.

Of the CATARRHAL FEVER, or the Continual Quotidian of the ancients.

It generally begins in the evening, with a shivering and
and a coldness of the extreme parts, especially of the feet, and soles of the feet; a cough; a frequent desire of making water, but the urine is small in quantity; a weakness of the head, an universal languor of the whole body, a fulness of the head, and a lassitude of the whole body, and a loss of appetite.

The immediate cause of this disorder is a sharp acid ferment or lymph, suffocating in the glandulous tunics, and irritating them with pain, tumour, and redness. This happens in the whole region of the nostrils, palate, and fauces; as also in the affera arteria, with the bronchial branches; and farther in the oesophagus, stomach, and intestines. Hence a hoarseness, a cough, a hawking up of viscid matter, a sneezing, a defluxion of the lungs: likewise a nausea, sometimes a vomiting; a heat about the praecordia; a griping of the guts, followed with a fa
dular flux.

It more frequently attacks women and children than men, and those that indulge themselves in strong liquors. It sometimes happens from the drying up of a fecal head and other eruptions. Sometimes it is epidemic.

This disease is most frequent in the spring and autumn, in sudden changes of the weather from hot to cold, from dry to moist, and vice versa; as also from change of air, if of different qualities; from being exposed to the cold air of the night, and from throwing off winter-garments too soon.

This disease is not dangerous in itself, if rightly managed, and terminates in seven or fourteen days at farthest: for the latitude of the body then disappears; and the other complaints, especially the head-ache and hemiplegia are appeased, when the catarrh appears, and there is a plentiful discharge from the nostrils.

It often goes off, in some, in the beginning, with an increased perspiration or by sweat; in others after a few days, by hawking up a large quantity of viscid matter, or a plentiful discharge of a mucous ferment by the nose; in others, by a loofeness, when the urine at the same time, which before was thin and little, becomes copious and heavy, with twice the quantity of sediment as in a natural state.

The intentions of cure are three, 1. To sheath the acrimony of the lympha. 2. To increase perspiration. 3. To promote the expectoration of the viscid mucus.

The saline sharpness of the lympha may be taken off by the absorbent and diaphoretic powders, humetty and oleous remedies; such as, oil of sweet almonds, iperma ceti, milk, cream, almond emulsions, with the addition of white poppy seeds, barley broth, water-gruel, chicken broth, with the yolk of an egg; as also liquorice-juice, liquorice-tea, dried figs and raisins. If the acrimony is very subtle and corroding, gentle anodynes should take place, such as faffron, diacodium, and florax pills.

To promote a diaphoresis,
1. Take a scruple of the powder of contrayerva; Vit-
barley-water to make the expectoration easy, and afterwards going into the air well cloathed.

Of the Semiterrian Fever.

This is an epidemic fever, compounded of an intermittent tertian and a continual quotient.

It generally makes its onset before noon, with coldness, shaking, and a contracted pulse; to which succeeds a frequent pulse, with heat, which continues some hours, till a warm sweat appears, without a complete intermission. The heat, after a slight chills, increases towards night, with a quick pulse; which is more moderate the next day, without thirst, till the evening, when a slight shivering comes on, and the symptoms return. On the third day, the shaking fit appears again with more intense heat, and proceeds in the same track as before; so that the fever is never quite off, but has an exacerbation in the evening: however, the shaking fit is most conspicuous every third day in the morning.

Besides the foregoing symptoms, the strength fails, the appetite is languid, sleep is wanting, the urine is thin and crude; but after the fit on the third day, it is thick and coloured, and a small quantity of crude matter is brought up with coughing. It is sometimes attended with a pain in the back and the abdomen, together with a swelling in the latter. Some at the access of the fit of the tertian, are affected with a nausea and cardialgia. Some vomit, others faint, and others again are delirious. The heat, after a slight chilness, increases to a temperature, diurnal and a continual quotidian.

The heat, after a flight chills, increases towards night, with a quick pulse; which is more moderate the next day, without thirst, till the evening, when a slight shivering comes on, and the symptoms return. On the third day, the shaking fit appears again with more intense heat, and proceeds in the same track as before; so that the fever is never quite off, but has an exacerbation in the evening: however, the shaking fit is most conspicuous every third day in the morning.

But the tertian fever, if the patient is plethoric, the heat urgent, the strength not much impaired, and when some critical hemorrhage is suppressed. All heating medicines are to be avoided, as well as fixt astringent earthy tinctuous powders; and also the bark, unless there is a perfect intermission; for this last, as Baglivj observes, has brought on fatal inflammations, or flow hectic fevers.

Of the Nervous Fever.

In a nervous fever, the patients at first are subject to phlegmatic transient chills, and then, with uncertain flushings of heat; they have a little chill, latitude, and weariness; they are apt to figh, and complain of a heaviness, dejection, and anxiety, with a load, pain, or giddiness of the head, with an inclination to yawn and doze; they want appetite, and disrelish every thing; they have a dryness of the lips and tongue without any considerable thirst; they have frequent nausea's, with reaching to vomit: the breathing is difficult by intervals, and especially towards night there is an exacerbation of the symptoms, with a low, quick, unequal pulse; the urine is pale, and made often and suddenly; a torpor, or obviety, pain and coldness often affect the hind-part of the head, or a heavy pain is felt along the coronary future. These commonly precede some degree of a delirium.

The countenance is heavy, pale, and dejected: sometimes they are quite wakeful; and when they fall asleep, they are lo insensible of it, that they disown it.

The pulse is very remarkable in this disease, and requires the most diligent attention; for it is generally low, quick, and unequal: the inequality consists in this, that a few pulsations shall be more swift, frequent, and large, sometimes fluttering; and then prefently it returns to be low and quick.

The urine has generally no sediment; and when it has, it is like bran; it is sometimes of a whey-colour, or like dead small-beer. The dryness of the tongue seldom appears at the beginning, though it is then sometimes covered with a thin whitish mucus; but at the close of the disease, it often appears very dry, red, and chapped.

About the seventh or eighth day the giddiness, pain, or heaviness of the head, become much greater, with a constant
frequently the forerunner of a delirium.

Now, cold sweats appear suddenly on the forehead and back of the hands, while the cheeks and palms glow with heat, and as suddenly go off. If the urine grows more pale and limpid, a delirium is certainly at hand, with universal tremors and subflexus tendinum; the delirium is generally little more than a confusion of thought and action, a continual muttering and faulting of speech. Sometimes they awake in a hurry and confusion, and presently recollect themselves, but forthwith fall into a muttering, then doze again.

At the flat, the tongue grows often dry, with a yellow lift on each side; and when the patient attempts to put it out, it trembles greatly. If at this time a copious spitting comes on, it is a very good sign. When there is a difficulty of swallowing or continual gulping, it is a dangerous symptom, especially with a hiccough.

On the ninth, tenth, or twelfth day, the patient often falls into profuse sweats, which at the extremities are commonly cold and clammy; and frequently there are thin floors, which are generally both colliquative and very weakening. A warm moifurine on the skin is reckoned falutary; and a gentle diarrhoea often carries off the delirium and sleepiness.

When the extremities grow cold, the nails livid, the pulse exceeding weak and quick, insomuch that it rather trembles and flutters than beats, or creeps surprizingly slow, with frequent intermissions; then nature sinks apace, the cordial and diaphoretic kind, in order to promote perspiration; by application of blifters, and by a proper regimen and method of diet. It will bear no other evacuations than moderate cordial diaphoretics, and blifters; unless a gentle emetic should be indicated in the beginning, or a small dose of rhubarb when it has continued long. Bleeding is very prejudicial, and much sweating hurtful. In giving diaphoretics, we should always have regard to the urine; for if that, from being pale, gradually heightens to an amber colour, we are right in our dose, especially if, when in bed, a gentle dew or moisture comes on without a rufllnsfnsf; and we must always remember, that over-sweating will raise the fever, and endanger the patient.

If the patient is inclined to deliquia or faintings on

If rest is wanted, give a few grains of the flores martiales; and if a loofenefs is not feared, the flores martiales may be more freely given.

A vomit ruffles nature much less than a common purge, and is necessary where a naufa, load, and ficknefs of the stomach, are urgent. If the body is cold, cliysters of milk, fugar, and falt, may be injected with safety and advantage every second or third day. The temperate cordial and diaphoretic medicines are certainly moft proper in these fevers; a supporting, well regulated, diluting diet is necessary, and will go a great way in the cure, especially if affifted by well timed blifters, and keeping the patient quiet in body and mind. Opiates are commonly very pernicious; mild diaphoretics, as pulv. contrayerv. compof. with a little caffer and faffron, and small quantities of theriac. androm. or elixir paregoricum, will have very much better effects. Where the confusion or defcription of spirits are considerable, galbanum or philum, with a little campfire, fould be added; and blifters fould be forthwith applied to the neck, occiput, and behind the ears: during all this, a free ufe of thin wine whey, fome pleafant ptisan, with a little foft wine, must be indulged. A little chicken-broth alfo is of fervice, both as food and phyfic, especially towards the decline of the disorder; and for the fame reafon, thin jellies of harthorn, fago, and panada, are useful, adding a little wine to them, with juice of Seville oranges or lemons.

It was faid above, that profufe sweats fhould never be encouraged; yet the patient is never fo eafy as while he is in a gentle, eafy sweat, for it foon removes the exacerbation of the heat, hurry, &c. when there are irregular partial heats, with great anxiety, ruflesnefs, delirium, difficulty of breathing, and a vast load and oppression on the præcordia, fo as to refeemble a peripneumonic cafe: yet beware of bleeding; for the small, low, quick, and unequal pulse utterly forbids it, as well as pale, waterly, limpid urine.

Here then the nervous cordial medicines are indicated, and blifters to the thighs, legs, and arms.

Take of the compound powder of contrayerva, 15 grains; of English faffron, 3 grains; a fecruple of the cardiac confection; and a fufficient quantity of fyrup of faffron to make a bolus.

When great tremors and subflexus tendinum come on, instead of the pulv. contrayerv. a fecruple of milk may be used.

This bolus fould be taken every fifth, fixth, or eighth hour, and a temperate cordial julep may be given now and then out of thin wine or cyder-whey, or, which in many cafes is better, out of thin muffard-whey.

But this difficulty of breathing, anxiety, and opprefion of the præcordia, often precede a military eruption on the feventh, ninth, or eleventh day, which fhould be promoted by soft, eafy cordials, proper diuents, sometimes with a little theriac. androm. or elixir afthma, as tending to calm the uneafines, and to promote a diaphorefis.

In profufe, colliquative sweats, give a little generous

R. 2 red
Towards the decline of the fever, when the sweats are copious and weakening, give small doses of the tincture of the bark, with saffron and snake-root, interposing now and then a dose of rhubarb, to carry off the putrid colic, which makes the intermissions or remissions more difficult and manifold.

When there is an evident intermission, give preparations of the bark out of draughts made with salt of wormwood and juice of lemon. This method will shorten these fevers, even with miliary eruptions.

Under any evacuations, diluting nourishment is absolutely necessary to keep up the spirits and repair the losses of the juices, and the patient should be frequently prompted to take them. When any discharges are very immoderate, they may be prudently restrained, but not rejected.

Gilchrist affirms, that to all the warming, attenuating, stimulating, or anti-pasmodic remedies, cinnamon should be added, and that in no small quantity. And he highly recommends the use of the bark in the decline of long nervous fevers, or after a remission. And when there is occasion for blistering, he thinks the head most preferable whenever it is much affected, though he does not disapprove the laying of blisters on the back and limbs.

When the low, depressing, nervous symptoms are stronger, the higher methods of stimulating are necessarily and easily borne; in raving, with a low, intermitting pulse, subsfultus, fainting, and coldness of the extremities, besides frequent blistering, we must give camphire and caltor. The use of Virginian snake-root, valerian, azailetida, myrrh, and terraceous absorbents, are well enough known, and the forms in which they are given. Refreshing juleps should not be taken by spoonfuls, but by draughts. Acidic cataplasmis may be laid to the feet till they begin to stimulate or raise a jiff degree of heat: then apply poultices of bread, milk, and vinegar, especially during the exacerbation, to allay the heat and fluridge; renewing them alternately, in order to keep up a gentle heat and fluimus. A quick, hard, and more contracted pulse, with smart heat, toiling and anxiety, shew it is over-done.

Of Epidemic, Catarhal, Eruptive Fears.

These fevers are continual, but not violent: they are attended with a profusion of strength, watching, loss of appetite, and are sometimes joined with an eruption of spots on the skin, arising from the plenty and intense diffusion of an excrementitious ferment, not without contagion and danger of life.

These fevers were called by the ancients, continual, quotidian, furous fevers; and by some of the moderns, malignant catarhal fevers, because they are mild at first, and attended with a running at the nofe, a catarh, an inflammation of the fauces from the stomach itself. If blood is taken away in these fevers, it is a sign of health: and this the more certain, if the contracted pulse enlarges, the hard grows soft and becomes more equal; if the patient is more cheerful, and his lying in bed more sedate, with a hardnees of hearing, and a turbid urine depositing a sediment. If this happens about the critical days, it is a certain sign of a happy event. After this the sleep, appetite, and strength, gradually return; and on other days except the critical. Those that die are carried off by a phrensy, or an inflammation of the meninges, or of the esophagus and fauces from the stomach itself. If blood is taken away in these fevers, it is either of a bright red, very fluid and serous, or too thick and blackish.

In the cure of this disease, the physician should take care not to disturb the salutary excretions, but proceed cautiously, and abstinence from strong medicines of every kind, watching and affhling the motions of nature as much as possible. The indications are, 1. To refrain and prevent...
M E D I C I N E.

vent the entire dissolution of the blood and humours. 2. To temperate and dilute the albuminous acrimony of the humours, and at the same time to keep the fluids fluid. 3. To promote gently the excretions by foot, urine, the skin, and spit.

To prevent the putrid dissolution of the humours, direct vinegar, the juices of oranges and lemons, and syrups of the same; spirit of vitriol, spirit of salt, spirit of nitre, especially those that are dulcified.

To abate the acrimony, absorbent, tinctures, and bezoardic powders will be proper. To dilute at the same time, you may order a decoction of barley with scorzonera and thavings of hartthorn; as also the syrup of orange juice, chicken broth, and the like.

To promote the cuticular excretions, give diaphoretic simple waters, aperient waters, with the tincture of valerian root, or black root. To all the excretions by foot, common domestic clysters will be useful; or those made of a decoction of barley, oil of sweet almonds, camomile flowers, elder flowers, syrup of violets, common salt, or nitre.

Or you may order the following laxative, which must be given with caution.

Take 2 ounces of manna, a dram of cream of tartar, 3 ounces of scorzonera water, half an ounce of syrup of violets, 3 drops of oil of juniper. Mix and make them into a draught.

To raise the spirits and restore the strength, a little wine will not be improper, with hartshorn jellies, China orange or Seville orange juice with sugar.

A congruous regimen in these febrile diseases is of very great consequence; for if the patient is kept too hot, the dissolution of the blood will be promoted, a coagulation will be induced, the anxiety will be increased, the impure and acid humours will be actuated, the strength will be exhausted, the sweating will be too speedy and profuse, and spots will appear on the skin. On the other hand, if cold is incausiously admitted, especially to the feet, perspiration will be checked, the eruptions and spots will be driven back: There will be griping pains, a loofeness, and the critical evacuations will be disturbed. All sudden changes from hot to cold, or cold to hot, are equally bad. A temperate regimen is best. However, care should be taken that the patient does not breathe his own atmosphere full of morbid exhalations, so very prejudicial to health; but the air should be drawn out of the room, and fresh admitted.

The perspiration should constantly be kept up, and the linen of any kind should not rashly be changed; nor should the patient be removed from one bed to another. He should be enjoined not to rise frequently. And if the bed cloaths are wet and must needs be changed, let them be well aired, and pretty much worn.

An erect posture of the head and body is to be shunned either in or out of bed, especially if the pulse is very weak and the strength little; as also when the disease is near the state.

The mind should be kept as cheerful as possible, and all occasions shunned of exciting anger, fear, terror, or pusillanimity in the patient. His hope of recovery should

be kept up as much as possible, instead of being terrified with the prediction of death.

It is an undoubted axiom, that all strong medicines are hurtful in this disease; such as emetics, purgatives, and diuretics; as also sudorifics of a too spirituous nature. But temperate and moderate things are very useful.

It must be remembered likewise, that these febrile diseases have certain times and periods, and exacerbations and remissions at certain times; which a physician should always carefully observe. In the febrile heat, and when the symptoms are most intense, humectants, diluents, and the absorbent nitrous powders abovementioned will be most proper, with a very moderate external regimen. When the pyrexym is ended, the skin lax, more soft, and disposed for excretions; then analeptics, medicines that stimulate; and if there is occasion, bezoardies, and things that promote perspiration; as also the infusion of veronica, scorodon, and liquorice, drank as tea, are likely to do the greatest service. And because a diarrhoea frequently carries off the disease, it is never to be fopt, especially about the critical times, neither with astringents, sedatives or opiates: But if nature tends to this excretion, and is too sluggish, she is to be assisted by the laxative draught above described, with the addition of tamarinds.

There is no evacuation so dangerous as bleeding at the nose; for then there is a conglutination of blood in the head from the spasms of the lower parts. However, if the flux of blood is moderate, and the body abounds with it, instead of being hurtful, it will relieve the head, though this seldom happens. When there are a few drops only without alleviation, they portend a delirium and an inflammation of the face: But when the flux is copious, the strength will diminish, and the eruptions return inwards not without danger. Therefore, to prevent a conflux of blood to the head, the feet must be always kept in a moderate heat and moisture; mild blisters should be laid to the calves of the legs, and the body should be opened with clysters or solutions of manna. These will also be serviceable when the hemorrhage is too large. But when it is too little, and the eyes look red and wild, with a strong pulsation of the temporal arteries, besides the former, it will be proper to apply cupping-glasses to the nape of the neck, or to thrust a straw up the nose, if possible, to cause it to bleed, or to use a scarifying instrument.

Bleeding in these febrile diseases must be used with great circumspection; for it is much more proper as a preservative than a cure. But when the disease has made its onset with great losses of strength, complicated with catarrhal disorders, and when putrid and malignant fevers are ripe, it must be always omitted. If the stomach has lately been surfeited with incongruous aliment, a grain or two of tartar emetic in a solution of manna will be necessary. Blisters will be of great use when a retrocession of the eruptions is apprehended, when the excretions are slow, and when there is a sleepiness and torpor; in which cases, they may be laid to the arms and calves of the legs.

Of the Malignant, Goal, and Spotted Fevers.

The true spotted fevers are very malignant, contagious, and detrimental to the head and strength, attended with spots of various colours, arising from a corruption of
of the vital fluids, and a putrid dissolution consequent thereupon.

These putrid fevers are deservedly called malignant, or poisonous, as they generally proceed from a most subtle, active, virulent vapour, or miasma, which is infectious. At first they often seem mild and gentle, and have the appearance of catarrhal fevers; but they soon exert their virulent effects in a most fatal manner.

At first the patient complains of great weakness and loss of strength, and is apt to faint away.

The head aches, and from the very beginning is hot, dull, attended with a dejection of mind. There is constant watchfulness; the appetite is lost; the pulse is languid, small, and unequal; there is an oppression of the breast, sometimes a dry cough, an undulatory and tremulous twitching of the muscular and tendinous fibres, with a subsultus tendinum. Many neither complain of heat, nor pain, nor anxiety, and affect that they feel nothing bad, but weakness and want of sleep. The urine is generally thin at first, and like that of sound people. On the fourth, or the seventh day, the spots appear principally on the back and loins, of various colours, generally without relief; wherefore they are rather symptomatic than critical.

Huxham says, these fevers attack with much more violence than the flow and nervous; the rigors, if any, are greater, the heats sharper and more lasting, yet at first sudden, transient, and remittent; the pulse more tenet or hard, but commonly quick and small, though sometimes flow and seemingly regular for a time, and then fluttering and unequal. The head-ach, giddines, nausea, and vomiting, are much more considerable, even from the very beginning. Sometimes a severe fixed pain is felt in one or both temples, or over one or both eye brows, frequently in the advance of the fever, though the pulse at the wrist may be small, nay, even low: This is a certain sign of an impending delirium.

The prostration of spirits, weakness, and faintness, are often surprizingly great and sudden; sometimes, when the pulse seems tolerably strong, the respiration is very laborious, and interrupted with a kind of sighing or foaming, and the breath is hot and offensive.

There is generally a sort of lumbago, or pain in the back and loins, a wearinefs, sorenefs, and pain in the limbs. Sometimes a great heat, load, and pain at the pit of the belly, with a perpetual vomiting of porridge or black bile, of a nauseous smell, with a troublesome hiccup.

The tongue at the beginning is white, but grows daily more dark and dry, or of a hissing; vivid colour, with a kind of bubble at the top; sometimes exceeding black for many days: At the height, it is generally dry, fliff, and black, and the speech scarcely intelligible.

The thirst, in the increase of the fever, is commonly very great, sometimes unquenchable; and all the drinks seem bitter and nauseous; at other times there is no thirst, though the mouth and tongue are exceedingly foul and dry; this is a dangerous symptom, and ends in a phrenzy or coma. The lips and teeth, near the palate, are furred with a very black tenacious fords.

At the onset of the fever, the urine is often crude, pale, and rapid; but grows to fo high a colour as to resemble a strong lixivium, or citron urine, tinged with a very small quantity of blood: it has no sediment, or cloud, for many days together; but by degrees grows darker, like dead strong beer, and smells offensive.

The ftoois, especially near the palate, or in the decline of the fever, are for the most part very offensive; green, livid, or black, frequently with severe gripes or blood. When they are more yellow or brown, the lefs is the danger: but the danger is greatest of all when they come away insensibly. If the belly be hard, swelled, and tenfe, it is a very bad symptom. A gentle diarrhoea is often very beneficial, by which nature carries off the morbific matter.

The more florid the spots are, the lefs is the danger; and it is a good sign, if the black or violet become of a brighter colour. The large, black, or livid spots, are almost always attended with profuse bleedings. The small dulcey, brown spots, like freckles, are almost as bad as the livid and black. Sometimes they are attended with profuoe, cold, clammy sweats; at which time the spots va-nish without any advantage.

The eruption of the spots is uncertain; sometimes they appear on the fourth or fifth day; sometimes not till the eleventh, or later. The vibices, or large livid or dark greenish marks, seldom appear till very near the fatal period. Sometimes about the eleventh or fourteenth day, when the sweats are profufe, the spots disappear, and vast quantities of small, white, military pustule break out. If there is an itching, smarting, red rash, it commonly greatly relieves the fick, as well as large, fretting, watery bladders on the back, breast, and shoulders. A scabby eruption about the lips and nofe is a falutary symptom; the more hot and angry the better. Brown dark aphthae are more uncertain and dangerous, as well as those exceeding white and thick like lard. They are followed with difficulty of swallowing, pain and ulceration of the fauces and oesophagus, with incessant hiccup; the whole prieme vie are at length affected, a bloody dysenterie comes on, and a mortification of the intestines.

Pringle observes, that in hospital, goal, or camp fevers, the first complaints are gentle horrors, and little feverish heats, alternately succeeding each other, with lofs of appetite; the disorder being greatest at night, the body is hot, the sleep interrupted and not refreshing. They have constantly some pain and confusion in the head, chiefly about their forehead; the pulse is at first but little quicker than the natural, and the drought, if any, is incon siderable. They are too ill to mind business, and too well to be confined. In this stage, a change of air, with a vomit and sweat, will perform a cure; yet a large bleeding at this time will sink the pulse, and bring on a delirium.

When the symptoms come on quick and violent, the fever seems to be inflammatory, and can only be distinguished by a knowledge of the circumstances; and bleeding yields no
no relief, but exasperates the complaints. The aforesaid symptoms are now more high, with great lassitude, nausea, and pains in the back, with pain and confusion in the head, and great dejection of spirits.

The pulse at this time is generally quick and full; now a moderate bleeding affects the pulse but little; if large, it will sink, and bring on a delirium. The worst kind of blood is when the craftamentum is dissolved, which is a sign of high putrefaction.

If the patients lie warm, the body is generally covered; if cold, there is a diaphora. If they have bilious fluids when they are warm, they are critical, and not to be checked unless immediate. In the worst kind of these fevers, in the last stage, a diaphora commonly carries the patient off; but then the fluids are involuntary, colliquative, ichorous, or blackish, and of a cadaverous smell, which are the effects of a mortification in the bowels. The heat of the body at first is not considerable; but if the pulse is felt for a while, there is an uncommon heat, which remains upon the fingers some minutes afterwards. A day or two before death, the extremities feel quite cold, and then the pulse is hardly to be distinguished. The skin is generally dry and parched; yet in the beginning there are often imperfect sweats, without any relief. A continued and generous sweat is the surest cure.

The tongue is generally dry, hard and black, with deep chaps; but towards the last it is soft and moist, and the colour is a mixture of green and yellow. The drought is sometimes great, at other times very little. Some preferve their senses through the course of the disease, except a confusion and slumber; but few keep them till death, if it prove favorable. They sleep seldom and seem to be penive and in deep thought. The face is not ghastly nor morbid, till towards the last. The confusion of the head often riles to a delirium, especially at night, but seldom changes to rage. A tremor is more common than a slumber or delirium, if the excrements come away insensibly, or if the urine is at the same time turbid, the fauces inflamed and beset with scabs, with difficult breathing and straitness of the breath remains and gains ground; or if a delirium increases after sweating, and a flux of the belly, the urine being at the same time turbid, and depositing no sediments; lastly, if the eyes are dim, the patient catching at straws; if there is a subsultus tendinum, if the excrements come away insensibly, or if there is a cold sweat with convulsions.

As to the prognostics, the spots are so far from being salutary, that the more plentiful they are the greater is the degree of the corruption: when they are livid, lead-coloured, and of a greenish black, they show a phlegmatic corruption. Those who escape are not freed by a cutaneous excretion, but by large sweats, breathing in a sinking acor or by critical fluxes of the belly; which happen by the benefit of nature, when the corruption of the fluids is not great. Many are apt to fall into a phlegmatic corruption of the stomach, intestines, and other viscerae, or into a phreny, or more frequently into an anginous inflammation of the fauces and oesophagus, as appears from the intolerable smell which happens after death. This unhappy event is prefaged, if there is no thirst, or one that is unequal; if the tongue is dry, chapt, black; if the fauces inflamed and beset with scabs, with difficult swallowing; if, after the eruption of the spots, a difficult breathing and straitness of the breath remains and gains ground; or if a delirium increases after sweating, and a flux of the belly, the urine being at the same time turbid, and depositing no sediments; lastly, if the eyes are dim, the patient catching at straws; if there is a subsultus tendinum, if the excrements come away insensibly, or if there is a cold sweat with convulsions.

Pringle observes, that those who are weakened by other distempers, or their cures, are more susceptible of the goal or hospital fevers than the strong and vigorous; and that one who is recovered is more subject to relapse, than he who is to be first attacked.

All the prognoptics, says he, taken singly, are uncertain. The following signs are good: to have no delirium; to have the pulse neither very low nor quick, or, if sunk, to have it rife by wine or cordials, with an agreement of the delirium; and to have the tongue moist, and of a natural colour. It seems peculiar to this fever, that deafness is generally a good sign. The natural and best crisis is by sweat, when the pulse rises, and the symptoms as well as the spots, do not appear till after death. This fever, on account of its exacerbations at night, may be looked upon as the lowest degree of the remitting kind.

The duration is uncertain, and in proportion to the virulence. Their course is generally from fourteen to twenty days: some have died or recovered after four weeks. When the course is long, it commonly terminates in abscesses of the parotid or axillary glands, sometimes in an hectic: Some, after this fever is over, fall into an irregular intermittent; many complain of a pain in their limbs, and want of rest; and almost all of great weakness, confusion in their heads, and noise in their ears. When the air is highly malignant, the disease terminates, in five or six days, either in death or a critical sweat.

The most peculiar symptoms of this disease, are always a singular attack upon the head, as a fuper, or pain; and if it lingers, a slow low voice, and sinking of the spirits, without any large evacuation; pale urine, petechial spots, the bad effects of large bleeding, or too many clysters; lastly, the disagreement of cooling medicines, excepting in the beginning; and on the other hand, the agreement with wine, volatiles, and other cordials, during the greatest part of the disease.
toms abate; next to that is an insensible perspiration, which is known by the softness of the skin, moisture of the tongue, and a remission of the other symptoms. Bilious fluids, with turbid urine, and a moist tongue, may be considered as signs of a favourable crisis. But the contrary of all these are bad; as also the fibrius tendini-um, inflamed eyes, and great anxiety. It is observed to be among the worst signs, when the patient complains of blindness, or when he cannot lie but on his back, and pulls up his knees; or if, when insensible, he endeavours to uncover his breast, or makes frequent attempts to get out of bed. If there are ichorous, cadaverous, and involuntary fluids, it is a sign of certain death.

The formal ratio of these pernicious fevers, consists in the putrid dilution or collection of the blood and vital fluids, especially of that highly elastic fine fluid which is contained in the blood, and separated in the brain and spinal marrow, by which it is distributed by the nerves to all the body, induced with sense and motion, for it greatly vitiates and desiles this liquid. However, such is the nature and power of that poisonous vapour, by which found bodies are infected, that it not only induces a putrid fermentation into the blood and other fluids, but acts immediately on the inward and nervous parts of the brain, which it corrupts, and produces a languor in the vital and animal powers, even while the state of the blood and humours remain free from corruption.

This virulent vapour enters the body by the nostrils, fauces, and bronchia; whence it immediately reaches the nerves in the brain, and renders the patient light-headed, with a dulness of the head, and a loss of strength, and a vertiginous affectation. It likewise mixes with the saliva, descends into the stomach, which is a nervous part, and there takes up its principal residence: whence the bad symptoms generally appear first in the stomach and praecordia, with a naufea and an inclination to vomit, as also a diarrhoea with gripes, or a colliquenes, with loathing of food, anxiety of the praecordia, and watery eruptions from the stomach.

Hence the reason evidently appears, why nothing is more proper to guard against this disease than turning away one's face from the patient, frequent spitting, chewing angelica, zedoary, or pimpernel, and smoking tobacco: hence likewise appears, why the force of this poison is exerted in the stomach, which is befit with copious crudities, and putrid and salivar fordes; and likewise why gentle emetics, joined to alexipharmics, commonly destroy the disease in the bud.

It may be induced by a bad state of the air: for a long moist, rainy, cloudy, and southerly state of the air, dulls and depresses the motions of the solids and fluids necessary for life: to this may be added a long and frequent inundation of water, which is apt to generate putrid diseases; as likewise the exhalations arising from purrid unburied bodies, or from the excrements of animals, especially if confined and shut up from the air.

In the regimen, it is necessary, if possible, to breathe a serene, temperately warm air. The room should not be heated too much, it being found to be hurtful. The patient should eat nothing solid in the decline of the disease, nor after it. A free use of food, of nourishing and comforting broths abounding with oleous particles is pernicious, especially about the critical days, in the state of the disease, or where there is any critical evacuation. Nothing is more hurtful than an erect situation. Alexipharmics, volatile farts, hot and spirituous bezardies, are hurtful, especially with a hot regimen: for they dilute the blood, and increase the number of spots; or cause head-aches, inflammations, or copious sweats.

Bleeding has been good in plethoric bodies, and in those who have been accustomed to hemorhages; on the contrary, if the patient is low or weak, bleeding is hurtful.

Gentle vomits are useful by way of prevention, and in the very beginning of the disease; but in the progress and state have had a bad effect. Blisters have been greatly praised in the state of the disease, when there has been a delirium, a sopor and convulsions, being applied to the neck.

We reject all opiates and soporiferous medicines, on account of the pulse and want of strength; because they retard the excretions, increase the malignity, and shorten death.

The medicines used are elder-flower water, that of limes, elms, roes, of the tops of scorzonia, scabious, and cardus benedictus; as also syrups of pomegranates, and the juice of roes; powders of mother of pearl, diaphoretic anthimony, crabs-eyes, amber, terra sigillata, burnt hartshorn, pure nitre. Alexipharmics are, camphire, essence and extract of scorzonia, vincetoxicum, the bezardie spirit and tincture, the essence or spirit of vitriol, and dulcified spirit of nitre: Moideners, the decoction of scorzonia, thavings and jelly of hartshorn: Analectics, orange-flower water, fresh oil of citrons, with sugar, confection of alkermes, and balsam of life: Antispasmodics, essence of caffor, eunabur, and succedent spirit of hartshorn.

In the beginning of the disease, use a bezardic powder of nitre, and a little camphire, often repeated in the progress and state of it, a mixture of temperate waters, diaphoretics, analectics, antispasmodics, and cordial bezardic powders, with a little juice of citrons. In the drink put nitre, or philosophic spirit of vitriol, or sulphurated chlaries of antimony, to keep the body open. Also give drink of the filtrated decoction of hartshorn, and root of scorzonia, either hot or cold. About the critical day give gentle alexipharmics, with things to promote sweat when nature seems to tend that way.

This is the best and surest method of cure. But if the vomiting is too great, with an anxiety of the praecordia, and profuse diarrhœa, accompanied with gripes, apply outwardly Venice treacle, expressed oil of nutmegs, camphire, oil of cloves, and balsam of Peru, mixt together, to the region of the stomach. If a diarrhoea exhausts the patient too much, give a nitrous bezardic powder, with a little camphire, and theriac caelestis. If the body is colitive, with gripes, prescribe lenient chyfiers, or such as are made entirely of oil. To raise the strength, allow spirituous things, such as comfort and are aromatic; but they must be externally applied to the pulses or pit of the stomach, or nostrils. To quench thirst, give an electuary of Molocovada sugar and dulcified spirit of nitre.
Nature many times strives in vain to discharge the irritative matter, by vomit, without the assistance of art; and therefore something to promote it will render it much easier; which may be done by an infusion or decoction of ipecacuanha, or oxymel scilliticum, with a light infusion of camomile flowers.

The prime vice should be unloaded by very gentle methods, such as clysters of milk, figar and salt; laxatives of manna, cream of tartar; Glauber’s purging salt, tamarinds, and rhubarb.

When there are signs of redundancy of the bile, it should be forthwith discharged by vomit or stool, as nature points out; which is often succeeded by an amazing change for the better, where an inexpressible anxiety, load on the precordia, perpetual sickness, eructation, and faintness, had preceded.

Between the seventh and fourteenth day, nature endeavours to relieve herself by vomit, or more frequently by loose stools; then given a gentle laxative the eighth and ninth day, unless some eruption appear, or a kindly sweat forbid it.

But the constant and grand effort of nature, is to throw off the putrid malignancy through the pores of the skin. If it be a breathing sweat at the state of the disease, and the pulse grows more open, soft, and calm, a little before and during its continuance, it is always salutary; but if it be profuse, cold, clammy, or partial, about the head and breast only, the sign is not good. Profuse sweats in the beginning are generally pernicious, especially if a rigor supervenes.

Sweats should never be forced by violent hot medicines, regimen, &c. Plentiful subacid diluents will be sufficient, and gentle cordial diaphoretics.

As acids and subarisingents are given to preserve the virtues of the blood and tone of the vessels, and to prevent the farther putrefaction of the humours, diaphoretics, especially camphire, should be joined with them.

Dr Brookes used the following prescription of the bark for many years with success, not only in intermittent and slow nervous fevers, but also in the putrid, pestilential and petechial, in the decline, though the remissions have been very obscure; but if the patient is colicive, or hath a tense or tumid abdomen, he permitted a dose of rhubarb, manna, or the like.

Take two ounces of Peruvian bark in powder, an ounce and a half of orange-skin, 3 drams of Virginia snake-root, 4 scruples of English saffron, 2 scruples of cochineal, and 20 ounces of spirit of wine. Mix and infuse the ingredients in a close vessel for three or four days, and then filtrate the infusion.

Of this give from a dram to half an ounce every fourth, sixth, or eighth hour, with ten, fifteen, or twenty drops of elixir of vitriol, out of any appropriated draught, or diluted wine. The above composition tends to strengthen the solids, to prevent the farther diffusion and corruption of the blood, and in the event to restore its crafts.

With this view also give a generous red wine, as a most noble, natural, subarisingent cordial, which is of high service in the flate, but more especially in the decline of these fevers, acidulated with the juice of Seville oranges or lemons, as also with cinnamon, the rind of Seville oranges, and the like, to which a few drops of elixir of vitriol may be added. Rheum and French white wines, when diluted, are also a most salutary drink, and generous cyder is little inferior to either.

Of the Pestilential Fever.

A pestilential fever is a most acute one, arising from a poisonous miaisma, brought from eastern countries; and unless it is immediately expelled out of the body, by the strength of the vital motions, by buboes and carbuncles, it is fatal.

It differs from other contagious, malignant, and eruptive fevers, because it is the most acute; for it sometimes kills on the first, and sometimes on the second day. Besides, in our climate it is not epidemic or sporadic, from a bad way of living, or unhealthful air; but happens when it is most salutary, from contagion alone. There is something very singular in this infectious miaisma; for though it is apt to spread at a strange rate, yet it will abate by intense cold, and be plainly extinguished: whereas in a cold season, and very cold countries, it either does not appear at all, or in a very mild degree; whereas if the climate is hot, it is not only most vehement, but most common.

In this, as in all other contagious diseases, the venous miaisma is swallowed in with the air, and infinuates itself in the salivale juice, where its tragedy is first acted. Whence it assails the head, brain, nerves, and animal spirits, producing a torpor in the head, a heaviness, a sleepiness, a violent pain, a flutter of the senes, a forgetfulness, inquietude, watching, and loss of strength. From the sauces it proceeds to the stomach, creating loathing of food, nausea, anxiety of the precordia, a cardialgia, attended with fasting, reaching to vomit, and vomiting itself. Hence it proceeds to the membranes of the spinal marrow, and the coats of the arteries, producing horrors, a languid, small, contracted, quick pulse, and even fainting. All these are generally signs and symptoms of the plague; which are of a more violent and quick operation, in proportion to the virulence of the pestilential miaisma.

All plagues are not of the same nature, but vary according to different constitutions and circumstances. Those who have written of the plague universally agree, that spungy and porous bodies of an obese habit, of sanguine and phlegmatico-sanguine constitutions; women, young persons, and children; persons of a timid disposition, that are poor, live hard, or are given to luxury, and fit and gentle cordial diaphoretics.
among the soldiers, they are called camp-fevers; in Hungary, an Hungarian fever. But the plague, or pestilence, is known when buboes and carbuncles arise in various parts of the body. The sweating sickness had its rise in England, in which the patient fell into a violent sweat, of which many died in a day's time.

The pestilential poison disturbs all the functions of the body; for unless it be expelled to the external parts, it is certainly fatal. Nor is this to be done as in other fevers, by large sweats, by floods, by a flux of urine, by cutaneous evacuations of blood, or by bleeding at the nofe, either natural or artificial, for they rather hallow destruction. The fulfatory and critical excrétion which perfectly solves the pestilential disease, is by tumours in the surface of the body not otherwise than the erysipelas, between the third and fourth day; and the sooner the better, for then the symptoms are mitigated. The pestilential tumours are of two kinds; the firft arifes in glandulous places, most commonly in the groin and arm-pits, sometimes in the parotid and mammary glands, as also the lower maxillary, under the chin, and in those near the aspera arteria. It is a hard, painful, teneive swelling of the glands, with great heat; and if they are fulitarian, being swollen, they grow soft, and suppurate. The other fort is the anthrax or carbuncle. Celsius describes it in this manner. It is a swelling on which there are pustules, which rise but little; they are black, sometimes sublivid or pale. In this there seems to be a fainess, it is black underneath. The body itself is more dry and harder than usual. There is as it were a crust about it, furounded with an inflammation; nor can the skin be raised up in the part, but is joined to the flesh underneath. Mindererus, who was precent at the plague, fays, that a carbuncle is of the size of a grain of mustard feed; and about its edge, there is a circle, or pufidard feed; and about its edge, there is a circle, or whitifh purple colour, or fometimes black. When the pufidules are prefsed, they feem to be full of pus; under which there is an ah-coloured crust, which being taken away, the flesh appears corrupted and flponge, with intolerable pain and burning of the circumjacent flesh, which is followed by a mortification of the part.

When the plague is fatal, some die of a fainting the firft or second day. But in many, when the poison is not expelled, or, if expelled, returns back, it brings on a mortification of the nervous coats of the noble parts, of the pleura, oesophagus, flomach and intestines, or the menings of the brain; which creeps speedily to all the vifcera, and the blood itself; whence the carcasses fwell, and have a moft intolerable fench. Sometimes, when the pestilential tumours are too plentiful, they die of a symptomatic fever, from the inflammation, pain, and intolerable heat.

It has been before remarked, that the plague is not a native of our country, but is brought from remote pla-
boiled, repeating them pretty often for twenty-four hours; in the mean while, the spirits of the patient are to be kept up with comforting broths. The by-flanders should forbear to wipe off the sweat, nor should the patient change his linen all that time, which is a necessary caution; if it be stopped before that time, it will be to no manner of purpose; during the sweat, the diarrhoea, if any, and the vomiting, will stop of their own accord.

Theriaca, and the like solid medicines, being offensive to the stomack, are not the most proper sudorifics. An infusion of Virginia snake-root, in boiling water, or, for want of this, of some other warm aromatic, with the addition of about a fourth part of aqua theriacalis, is safer.

Those who are obliged to be near the sick, must take care that the misfumata do not approach their vital juices, nor yet the saliva. To this purpose, frequent spitting, and washing the mouth with vinegar, or wine, or sniffing them up the nose, are useful. The efficacy will be still greater, if they are imbued with rue or citron rind. For an acid is the genuine antidote of a putrid and sulphurous misfma. Wherefore it is much safer to hold acids in the mouth, than alexipharmic roots. It will be like-\(\text{wise proper to get a few spoonfuls of Rhenish wine, or}\) bezoardic vinegar, diluted with water or wine, and so take them. The Turks deal much in the juice of lemons.

When the plague is actually begun, and the body is coltive, a gentleclyster should be used. Then a sweat should be promoted (twenty-four hours at least,) that the poison may exhale and pass through the skin; and epimathes to the heart will not be without benefit, though they reach only to the right orifice of the stomack, and its nervous coats; they may be made of theriac, expressed oil of nutmegs, camphire, saffron, caltior, and balsam of Peru. But above all, acids are highly praised; such as, juice of citrons, Seville oranges, lemons, vinegar, &c. which repel poison, purtexfaction, and prevent the dissolution of the blood.

When the strength of the disease is vanquished, gentle laxatives will be proper to expel the fordes during the course of this disease.

It is worthy observation, that few medicines are best; for which reason people of the lower clafs generally come off better than perfons of disting. and there is nothing worere than to give alexipharmics abounding with a hot volatile oil; much less ought volatile spirits to be given, for they fix the poison upon the nervous parts. Yet herbs and roots of this kind are not altogether to be condemned, if mixed with acids and nitre. A mixture of cardus benedictus water, and wine vinegar, when given to four spoonfuls, with a dram of crabs-eyes and theriaca, and repeated, were very useful in the plague at Hall in 1682. In the plague likewise in Lombardy, 1526, many re cured with the juice of goats-riue, vinegar, water of cardus benedictus, and a little theriac, given to make the patient sweat: and Thoper observes, that nothing was of any advantage in the plague except theriacal vine gar given in the beginning to promote a sweat. And in the year 1544, when a malignant fever raged among the foldiers, a whole regiment was saved, to whom this vinegar was given in due time, except a very few. And in the plague at Rome, vinegar with rue, pimpernal roots betony, garlic, and juniper-berries, with a little camp phire added to the infusion, caused many to escape. Likewise the preservative water of Sylvius has been greatly esteemed, because of the vinegar. And Mindererus afferts, that unlefs alexiterials be given within twenty-four hours, all medicines are vain.

Of the Miliary Fever.

A miliary fever is not unlike a cattarrhal, and is attended with a more intense motion of the vascular and nervous system, whereby a corrupt lymphatic matter of a peculiar nature is expelled from the inward, and more especially the nervous parts, to the surface of the skin, in the form of small, rough, miliary pustules, sometimes red, and sometimes white.

These small pustules are exceeding numerous, causing a corrugation, roughness, and dryness of the skin, and have a fetid smell peculiar to themselves. There is no eruption so inconstant as this, for it will sometimes strike in suddenly, and as suddenly appear again, and is attended with an itching pricking sensaion more than any other kind. Other eruptions are common to all countries, and are equally vexatious to men as well as women; but the miliary feems familiar and endemic to some places only, and more frequently attacks the female sex, especi ally in child-bed. It is neither epidemic nor contagious; and feems rather owing to a fault in the vicera and fluids, than the intemperature of the air.

The miliary eruptions are either red or white, and are both more or lefs acute, benign or malignant. The red are lefs dangerous, are generally free from a fever, and then are miliary, appearing at flated feasons of the year; but sometimes they are accompanied with an acute fever. The white seldom or never appear without a fever, and therefore are more dangerous. In these the lymph is affected with a kind of acidity; for the patient discharges plenty of serum by sweat, urine, foal or fali vation, which are the effects of an acid which coagulates the thicker part of the blood, and separates the serum from it. Besides, all kinds of acids and refrigerants, not excepting nitre, freely taken, are moss hurtful in this dis ease. On the contrary, absorbents and anti-acids, and things which render the blood spiritious, are moss fel autive. Women who eat much fruit, and such like trash, of the acceftent kind, and live idle fedentary lives, are moss subjeft to this disease.

Sometimes the miliary eruptions are idiopathic, and sometimes symptomatic, and suprervene to other fevers, especially the continual, when on the decline. They likewise appear very commonly with the measles, small-pox, putrid and spotted fevers, when drawing towards an end; and then they raise a new fever, whole attack the debilitated patient is not able to stand.

The idiopathic begins with a flight shivering, succeed ed with heat and loss of strength, sometimes even to fainting. There is a freartness about the breath, attended with anxiety and deep sighs. Rellifenehs and watching. There is a pricking kind of a heat perceived in the back, with an alternate succession of cold, shivering, and heat under the skin, but moss sensiible in the palms of the hands.
hands. Women in child bed have the flux of the lochia flopped, and the milk recedes from their breasts. To these succeds a roughness of the skin like that of a goose; and a great number of pustules appear, sometimes white and sometimes red, or both together, of the size of millet (or mustard) feed. They first befet the neck, then the breast and back, and afterwards the arms and hands. When these begin to rise on the surface of the skin, the more grievous symptoms cease. The pule, which before was hard, contracted and quick, grows more soft, free, and slow; the dejection of mind goes off, the skin becomes moist, and the belly, which was bound so much that the patient could not break wind, now spontaneously admits him to go to stool. Afterwards the pustules ripen, and are full of a flinking ichor. The urine appears more saturated, and a singular fetid sweat, proper to this disease, breaks forth; the flux of the lochia in females returns, and within the space of seven or eight days the pustules disappear, with great itching in the extreme parts, drying up and falling off in scales. Then the patient recovers strength, and regains health.

It is hard to determine the day of the eruption of the pustules; but it is generally the tenth or eleventh day from the beginning, if the fever makes a regular progress; sometimes on the eighteenth, and sometimes on the twenty-sixth, or twenty-second day.

Bad signs are, when the miliary pustules appear and vanish by turns, and the symptoms continue violent; but it is worse if they quite disappear: Hence an oppression of the breast, with fighs, a fainting fit, arising from a mortification of the digestive organs, in the stomach, intestines, brain, or womb.

Fatal signs are, when the morbid matter not being thrown out again, there is an inward heat and the extreme parts are affected with cold and thivering, and there is a cold profuse sweat; or, on the contrary, when the extreme parts are hot, and a notable sense of coldness is perceived in the abdomen, then the patient dies in a fainting fit, arising from a mortification of the stomach, intestines, brain, or womb.

The cure of this fever depends on the following things. 1. To correct and temperate the acrid morbidic matter which disturbs the nervous parts. 2. To relax the spastic fibrillae of the nervous fibres proceeding from thence. 3. To evacuate the prepared morbidic matter through the pores of the skin, and prevent its striking in. To dilute the spiciness of the humours, and to appease the irritation of the nervous parts, the following decoction may serve for common drink.

Take shavings of hartshorn, scorzonera root, and farfaparilla, of each two ounces; and boil them in 6 pounds of water.

Let the patient be always kept in an equal moderate heat, and abstain from strong aperitives, and things actually hot, because they throw him into too profuse a sweat. But when there is an apprehension of the pustules striking in, then the decoction may be drank hot, with moderate aperitives, as the exigence requires. Nor should the medicines be too cooling, because they increase the anxiety and faintness. In the red hot, when there is an internal heat, with thirst and great pule, diaphoretics with a little nitre will be proper; even though red and white pustules appear together. But nitre alone should be used with caution, especially when there are signs of malignity. No malt liquor should be drank, but the former decoction.

The belly should be neither too much bound nor too open; yet even the gentle laxatives are not to be given till the pustules begin to dry; and then there is nothing else required but an emollient clyster.

Bleeding should be very cautiously used; for when the weakness is excessive, the sweats profuse, and the pulse quick, it must be omitted. On the contrary, it is necessary for childbed women, when the lochia are suppressed, and the symptoms of a miliary fever begin to appear; but then it must be done speedily, and the great anxiety, fainting, and difficulty of breathing will cease, and the pustules break out.

Blister on the back are very proper for this disease; for they help to draw off the impure mercurial humours, and dilate the fatigued nervous fibres to a contraction, so as to expel the morbidic matter.

Of the Scarlet Fever.

The scarlet fever may happen at any season of the year, but it appears most commonly towards autumn. It reigns chiefly among children. It begins with coldness and thivering, as in other fevers, without any violent sickness. Afterwards the skin is covered with red spots, which are larger, more florid, and not so uniform as the measeles. The redness remains two or three days, and then disappears; then the cuticle falls off, and leaves behind it a fort of mealy scales, scattered over the body, which appear and disappear two or three times.

Let the patient abstain from flesh, all hot cordials, and spirituous liquors; let him not go out of doors, nor be confined constantly to his bed; and then medicines will be of little use.

Apply a blistering plaster to the neck, and every night give a paregoric of diacodium; and after the fever ceases, let the patient be purged with a very gentle cathartic, agreeable to the age and constitution.

Of the Measles.

The measeles are an eruptive catarrhal fever, generally epidemic, which by the increased vital motion of the heart and arteries throws on the skin an acrid, caustic, inflammatory matter, in the form of red spots. They begin with chills and thivering, and heat and cold succeed by turns. The next day the fever comes on with great sickness, thirst, and loss of appetite: the tongue is white, but not dry. There is a little cough, a heaviness of the head and eyes, and a continual sleepiness. There is a sneezing and a swelling of the eye-lids, a serous humour oft diffils from the nose and eyes, which are certain signs the eruption is at hand. In the face the spots are small; but on the breast broad and red, not rising above the surface of the skin. The patient often has a looseness, with greenish fots.

These symptoms continue and increase till the fourth, sometimes the fifth day; at which time spots like fleabites appear, increasing in number and magnitude, and in some places run together, rendering the face variously spotted.
MEDICINE.

The small-pox is commonly divided into two kinds; the distint and confluent.

The distinct fort begins with chilines and shivering, intense heat, a violent pain of the head and back, an inclination to vomit: in adults, a great propensity to sweat; a pain at the pit of the stomach, if it be pressed with the hand; a dulness and chrowniness, and sometimes epileptic fits, especially in children; and if the breeding of teeth is over, it is a sign the small-pox is at hand; for if the fit happens over night, the small-pox will appear in the morning, and are, generally speaking, of the favourable fort.

On the fourth day from the beginning they break out, sometimes later, seldom before, at which time the symptoms either abate or wholly disappear.

The spots at first are reddish, and spread themselves over the face, neck, breast, and the whole body. Then there is a pain in the fauces, which increases as the pustules grow turgid.

On the eighth day the spaces between the pustules, which hitherto were white, begin to grow red and swell, and to be afflicted with a tensive pain. The eye lids are puffed up, and close the eyes; next to the face, the hands begin to swell, and the fingers are dilated; the pustules of the face, before smooth and red, begin to be rough, (the first sign of maturation,) and whitish, and throw out a yellowish matter, in colour like a honey-cob.
The inflammation of the face and hands being now at its height, the interstices between the pustules are of the colour of damask roses; and the more mild the disease is, the greater is the likeness.

The pustules about the face, as they ripen, grow more rough and yellow. But on the hands and the other parts of the body, they grow whiter and less rough.

On the eleventh day the swelling of the face and inflammation disappear; and the pustules being ripe, and of the size of a large pea, grow dry, and fall off.

On the fourteenth or fifteenth day they vanish entirely; except some obstinate pustules on the hands, which continue a day or two longer, and then break. The rest come off in branny scales, and in the face leave pits behind them.

Through the whole course of this disease the patient's body is either wholly bound, or he goes to stool but very seldom. Generally those who die of the small-pox die on the eighth day in the distemper, and on the eleventh in the confluent fort. Then the face, which ought to be turgid, and the interstices florid, on the contrary is flaccid, and whitish, at the same time that the pustules are red and elevated, even after the death of the patient. The sweat, which was injudiciously promoted by cordials and a hot regimen, suddenly ceases; in the mean time the patient is seized with a phrensy, a violent anxiety, a trembling and sickness; he makes water often and little, and a few hours close the tragical scene.

In the confluent fort there are the same symptoms, but much more violent. The fever, anxiety, sickness, vomiting, &c. more cruelly torment the patient; yet he does not so soon fall into a sweat, as in the distinct kind. A looseness sometimes precedes the eruption, and continues a day or two after it.

On the third day, sometimes before, seldom later, the spots appear; and the sooner, the more will they run together. Sometimes the eruption is retarded till the fourth or fifth day, by some terrible symptom; such as, a most acute pain in the loins, like a fit of the gravel; in the side, like a pleurisy; in the joints, like the rheumatism; in the stomach, with a sickness and vomiting.

But the symptoms do not remit after the eruption, as in the distinct fort; but the fever and other complaints continue to molest the patient many days after. Sometimes the spots appear like an erysipelas, sometimes like the measles, but are distinguished from them by the time of the eruption. As the disease increases, they do not rise to any considerable height, being intercepted with each other in the face; but appear like a red blister, and cover all the countenance, which swells sooner than in the distinct kind. Afterwards they seem not unlike a white pellece glued to the face, and are not much higher than its surface.

The eighth day being past, the white pellicle grows daily more rough, and of a dusky colour. The pain of the skin becomes more intense, and at last, in the more cruel kind of this disease, they do not fall off in broad large scales, till after the twentieth day. But this in the mean time is worthy of observation, that the more the ripening pustules are of a brownish colour, they are the worse, and the longer in falling off; and the more yellow they are, the less they run together, and the sooner they disappear.

When the pellicle falls off, there is no roughness on the face, but branny scales soon appear in its room, of a very corrosive nature, which leave deep pits behind them, and sometimes ugly scars; sometimes the shoulders and back are quite deprived of their cuticle.

The danger of the disease is to be estimated from the number and multitude of the pustules on the face alone. The pustules of the hands and feet are the greatest, and the farther they are removed from the extremities, the less they are; in adults a salivation, and in children a diarrhoea, is a sign, though not always, of the confluent fort. The spitting sometimes begins with the eruption, sometimes two or three days after it; the matter is at first thin, but on the eleventh day it is viscid, and hawked up with difficulty; the patient is thirsty and hoarse, extremely sleepy, and his senses exceeding dull: he sometimes coughs when he is drinking, and the liquor regurgitates through his nostrils: then the salivation generally ceases, but the swelling of the face ought not to go down quite till a day or two after, when the spitting is over; if the hands do not begin to swell remarkably, and continue so for some time, the patient will suddenly leave the world.

The diarrhoea does not so soon attack children as the salivation does men. In both forts of this disease the fever predominates from the first onfet till the eruption; then it abates till the pustules are ripe, at which time it terminates.

The day on which the patient is most in danger, in the least crude and most common fort of the confluent, is the eleventh from the first attack of the disease; in the more crude, the fourteenth; and in the most crude, the seventeenth: sometimes, but very seldom, the patient does not die till the twenty-first. But in the space of time from the eleventh to the seventeenth, as the evening comes on, the patient is daily tormented with a fit of inquietude.

In the management of the patient in the distinct fort, regard should be had to the season of the year, and the strength of the patient. Let this be a general rule, to keep the patient in bed during the first days of the distemper, taking care to defend him from the inclemency of the winter by proper means; and to moderate the excessive heat in summer by cool air. For the patient ought not to be dressed by heat and cloaths, nor should the eruption and perspiration be checked by cold. However, great care ought to be taken in general to supply him with pure and cool air; because a hot air causes difficulty of breathing, checks the secretion of urine, and increases the number of pustules on the internal organs of the body.

With regard to Diet, it ought to be very slender, moistening, and cooling; such as oatmeal or barley-greuel; and in the beginning, the best regimen is that which keeps the body open, and promotes urine. This end is obtained by boiling preferred fruits with their food, such as figs, Damascene plums, and tamarinds; and by giving them subacid liquors for drink; as small-beer acidulated with orange or lemon juice; whey turned with apples, boiled
boiled in milk; emollients made with barley-water and
almonds; Moselle, or Rhenish wine plentifully diluted with
water; or any other things of this kind.

In the cure, Sydenham directs bleeding on any of the
three first days to nine or ten ounces; and then an
ounce, or an ounce and a half of emetic wine. But some
physicians will not allow a vomit by any means, unless
there is a nausea, and the head is much affected. Yet
Hoffman judges it to be proper on the first day of the
invasion, and prescribes two grains of emetic tartar disso-
vled in cinnamon water, to adults.

In youths and adults, it is often necessary to take away
blood two or three times, only with an intermission of
two or three days between each time. Blood-letting is
so far from being an obstacle to the eruption of the pu-
stules, if the patient is not too weak, that it forwards it
considerably.

After Bleeding, a vomit should be given, if the stom-
ach abounds with phlegm or bile, or be loaded with
food unfeasonably taken. Otherwise a purge may be
prescribed before the eruption of the pustules: which
may be the infusion of fena with manna, or manna alone,
evenly for children; for no disturbances to be raised
in the body.

To keep the inflammation of the blood within due
bounds, and to assist the expulsion of the morbid matter
through the skin,

Take half an ounce of bezoar in powder, 2 drams of
purified nitre. Mix, and beat into a powder.

Half a dram of this may be taken by an adult three or
four times in a day; diminishing the quantity for chil-
dren in proportion to their age.

Sometimes equal parts of these ingredients may be pre-
scribed; and if the evidence of the fever runs very
high, a proper quantity of the spirit of vitriol may be
added to the patient's drink. But if there be any reach-
ings to vomit, they will be removed by draughts con-
taining half an ounce of the juice of lemons, with one
scirpule of the salt of wormwood.

When the eruption of the pustules is compleated, which
generally happens on the sixth day from the attack, let the
patient take an ounce of diacodium every evening till the
tenth day after the invasion. On that night, if the small-
pox be of the confluent kind, the dose must be increa-
sed to an ounce and a half; and an ounce in the morning;
and so an ounce and half every night till the patient is
recovered.

Whatever are the fort, and at whatever time of the
disease a phrensly shall happen, it is to be curbed by pa-
egorics, given one after another till the end is obtained,
only waiting to see the effect of one dose before another
is ordered.

In the mean time, if the patient is colitive, which is
generally the case, and the fever continues, the body
is to be opened with a clyster every second or third day.

If the method is proper in the different small-pox, it will
be found more necessary in the confluent, which is attend-
ed with greater feard and danger.

In every fort of this disease, it is proper to open the
body on the decline, that is, on the ninth or tenth day
from the eruption, because a putrid fever generally comes
on about that time, while the pustules are drying, or up-
on the subsidence of the swelling of the inflamed skin,
where there is no suppuration, which fever cannot be ta-
klen off with equal safety by any other means; but gentle
cathartics alone are to be employed in this case, such as
were directed before the eruption of the pustules.

It will also be of use at this time to take away some
blood, if the heat be too great, and the patient have
strength to bear it.

This putrid fever is by Sydenham called the secondary
fever, which comes on with heat, inquietude, toffing,
&c. and, unless prevented, takes off the patient in two or
three days. He mentions this fever as coming on the
eleventh day, or later; but this is to be understood from
the time of the invasion, whereas Mead reckons from the
time of the eruption. Sydenham prescribes large bleed-
ing, and a cathartic two days after, viz. one ounce of
lentive elecutary dissolved in 4 ounces of simple alexer-
tial water, together with the free use of paregorics.

If the spittle through heat is so tough that it cannot be
hawkèd up, let a gargle be frequently injected into the
throat with a yringe. It may be compounded of barley-
water and honey of roses.

When the matter of salivation grows very vifcid, and
begins to clog the larynx and trachea, the bell me-
thod is to boil marf mallows, myrhh, and honey, in a
sufficient quantity of water and vinegar, and to tranmit
the team of the decoction into the patient's mouth, thro'
a glafs or tin tube, of fuch a shape and length as is most
commidious for a recumbent posture.

From the eighth day to the end of the disease, gar-
llick may be applied to the soles of the feet; which must
be renewed every day, especially when the brain is af-
feated.

When the pustules are perfectly dry and withered, the
face may be anointed with a liniment, made of equal parts
of oil of sweet almonds and pomatum, for two days and
no longer.

Twenty one days after the invasion, let a vein be op-
ened in the arm, and the next day give a cathartic,
which may be repeated every other day three times more.

This is necessary, because no species of fever requires
the body to be thoroughly cleared of the remains of the
disease more than this. After the cathartics, the body
is to be restored to its former state by a course of milk,
especially that of affes, with suitable food, and the air
and amufements of the country.

As there are particular accidents in the small-pox which
do not commonly occur, it will be proper to lay some-
ting of them. Sometimes the patient is feized with con-
vulsions jult before the eruption, which is rather a good
than a bad sign in children. In this case, blood-letting is
carefully to be avoided; but a blister is to be applied to
the neck, and to the soles of the feet. Pluifters made
of equal parts of the cephalic and blistering plasters; not
forgetting to give antispafmodic medicines inwardly.
The chief are wild Valerian root, Russian caftar, and the
spirits of volatile salts chemically extracted from animals.

In adults, the thing is otherwife; for they, if not too
weak, may lose a moderate quantity of blood, and then
be put into the foregoing method.
Haller tells us, that camphire afflicts greatly in filling
the small pox of the confluent kind with petechiae; and
Monro, that the Peruvian-bark does the same, that it
filled the empty vesicles with matter, changed the watery
fancies into thick white pus, made the petechiae or spots
turn gradually to a pale colour, and caufed the pox to
blacken sooner than was expected. The dose in powder,
is from ten to twenty grains, in some rich syrup, with
an aromatic diluted water, every four or five hours.
Children may take it in a Clyfter, with a small quantity of
warm milk, after the bowels are unloaded with a prepara-
ory Clyfter. If the Clyfter was retained too short a time,
Syrop of poppies was added, or diafcorid. These injec-
tions were repeated morning or evening or oftner. The
bark has had good effects in mitigating the secondary fever.
When the lungs are greatly diffused, it is not to be given.
When the eruption appears without much fear or pain,
it is not without danger; for the pufules frequently do
not tend to maturity, and there is no fuppuration made.
Hence the fever increafes, with inquietude of body, anxie-
ty of mind, difficulty of breathing, and a delirium, which
carry off the patient in a few days. In this fat, the
fever ought rather to be raised than checked; and then
warm medicines are to be directed which promote fuppua-
ration, by increafing the motion of the blood, and thinning
the humours, fuch as Virginia flake-root, contrarvav-
root, faffron, alia ictida, myrrh, and the like.

But above all, Blisters must be laid on the limbs.
When the matter of the infection is over abundant, as
it happens in bad cafes, nature never fails endeavouring to
throw off the load. Thus in adults a fptting comes on
upon the firft days of the eruption; whereas children have
loofenefs almoft through the whole difeafe, which is
not to be inconsiderably flopped. So in adults, if the
fptting does not go on to our wifhes, it ought to be pro-
moted by medicines which incite. The glands of the
mouth, efpecially gargles made of a decoction of mustard-
feed and pepper, with the addition of oxyymel. For in
the confluent and malignant small-pox, if this flux does
not arife and continue to the end of the difeafe, it is a very
bad sign.
The method of abating the rigour of this difeafe, and
preventing the great mortality with which it was often
attended, by incufation, is now fo well known and fo
generally practifed, that a particular detail of it in this
place is unnecelfary.

Of the Eryfipelas, or St Anthony’s Fire.

An Eryfipelas is an eruptive fever, from which no
part of the body is exempt; but it chiefly attacks the face.
It begins with chills and shivering, and other com-
mon symptoms of a fever. The part affected fwell a
little, with great pain, and infente rednefs, and is befet
with a vast number of little pufules; which when the
inflammation is increafed, are converted into small bliflers.
This difeafe has great affinity with a phæntial fever;
for it begins suddenly, with great flaking, heat, lobs of
strength, violent pain in the back and head; to which
may be added vomiting, and a delirium; but this is to
be underflood of the worst fort. On the third or fourth
day the malignant matter is thrown out on the surface of
the body, and then the fymphs a little abate. There
is often a pain, rednefs, and tumour in the inguinal glands,
from whence matter of a hot fiery quality descends to
the feet. If the head is attacked, the parotid glands are
affected; if the breasts, the axillary. The mammary
and axillary glands are not seldom ulcerated, and affect
the joints with a virulent corruption. And likewife, as
in the plague, there is nothing more dangerous than the
return of the expelled matter back from the surface of
the body to the inward parts.
In some, espefially young perfons, the matter is not
fo virulent, nor the fever fo great; the glands remain
unaffected, and the eruption happens on the second day.
This is not at all dangerous.
An eryfipelas is either true, or fimple and fpurious,
which is likewife called fcorbutic. The fpurious only af-
fects the surface of the skin, and readily yields to proper
remedies. But the fpurious is more chronic, is harder to
cure, and often degenerates into malignant ulcers. Be-
sides, this difeafe is fometimes idiofopathic, or a primary
difeafe; and fometimes symptomatic, or asecondary
one. For inftance, in the anafarca, the afcites, the yel-
low and black jaundice, a symptomatic eryfipelas fomet-
times supervenes, and quickly kills the patient.
If it feizes the Foot, the parts contiguous will fìnn;
if it be attended with great pain, it will ascend to the legs,
and will not bear to be touched.
If it attacks the Face, it fwell and looks red, and
there are plenty of watery vesicles. The eyes are closed
up with the fwellling; there is a difficulty of breathing;
the fauces and noftils are very dry, often attended with a
numbnefs and drowfiness: hence an inflammation of the
brain is to be feared, or a mortal lethargy.
If it affects the Breasts, they fwell, and grow almost
as hard as a flone, with exquisite pain, and they are very
apt to fuppurate. There is a molt violent pain in the
axillary glands, in which an absces is often formed.
In children the umbilical region generally fuffers, with
a fatal event.
In a day or two the tumour fübides, the heat-and
pain ceafe, the rosy colour turns yellow, the cuticle
breaks and falls off in fcales, the danger is over. When
the eryfipelas is large, deep, and falls upon a part of ex-
quifite fenfe, the patient is not very fafe. But if the red
colour changes into black and blue, it will end in a mor-
tification. If the inflammation cannot be difcuffed, it
will fuppurate, and bring on fultulas and a gangrene.
When the patient is cacochymic, the leg will fometimes
fwell three times as big as the natural fize, and is cured
with great difficulty. Thofe who die of this difeafe, die
of breathing, fometimes a delirium, fonretimes with fleepi-
ness; and this in seven days time.
Let the patient’s diet be only water-gruel, or barley-
broth; with roasted apples. If he drinks any beer, let it
be very small; and let him keep out of bed fome hours in
a day.
Take away 9 or 10 ounces of blood, and the next
morning let the patient take the common purging poftion.
It is a confant rule among practitioners, in all acute
and eruptive fevers, to keep the body in a gentle diapho-
refis.
inflammation. The same method is to be observed in this disease.

If the patient is plethoric, addicted to spirituous liquors, and more especially if the disease attack the head, bleeding is necessary.

It will be safest to avoid external applications, unless a powder made of elder-flowers and liquorice sprinkled on the part; or lime water, mixed with a fourth part of spirit of wine and camphire, dipping a linen cloth in it several times doubled, and applying it hot to the part.

An infusion of escorbutum, elder-flowers, and fennel-seed, drank in the manner of tea, is useful to expel the morbid matter.

If the disease does not yield to the first bleeding, let it be repeated; if that will not do, let it be reiterated twice more; one day being interposed between.

On the days free from bleeding, prescribe a cylinder of milk and syrup of violets.

Some think purges not necessary in the beginning of this disease; but in an erysipelas of the head, when it affects the brain with a coma and a delirium, either the cafe is desperate, or cathartics will succeed. However, first apply blisters to the neck.

If, after all, the tumor remains, and begins to turn livid; if the pain is deep, and seems to reach the perioleum, and the part has a tendency to ulcerate; then it will be proper to promote a suppuration; at the same time endeavouring to stop the progress of the putrefaction. For this purpose the common plaster will be proper, with a sufficient quantity of camphire and astrin.

When there is a mortification coming on, give things inwardly that resist putrefaction, as nitre and a little camphire, or rather the Peruvian bark. Outwardly apply a mixture of lime-water, camphorated spirit of wine and vinegar with litharge; as also tincture of myrrh, or of myrrh and aloes made pretty hot, with a linen cloth doubled, and often repeated.

In the scorbutic erysipelas, which continues for some time, it will be proper to give gentle laxatives and purifiers of the blood, with diaphoretics. After the body has been opened for some days, give diuretics and diaphoretics alternately for a considerable time; and for common drink, order a temperate decoction of mucilaginous woods and roots with bitters; particularly fucus roots, dandelion-roots, and raisins.

Of the Synochus, or Continual Fever without remission.

This fever, by some called Synochus, by others a Continual Fever, is an acute sanguineous fever, because it is raised by a congestion of the blood, chiefly in the nervous-membranous parts; which, unless timely diffused by the benefit of nature and art, produces a fatal inflammation.

It begins, in some, with a mild sense of cold, and is soon attended with very grievous symptoms, continuing without remission till the critical time, with a great and full pulse. If the blood is forced to the head, for it always affects one part more than another, the face will swell, the eyes will be red and full of tears; there is a pain in the head, with a pulsation of the temporal arteries, a vertigo, a sleepiness, torpor, or a raving. When the blood rushes impetuously into the ventricles of the heart and pulmonary vessels, causing a distension therein; then the breathing will be thick and difficult, with a straitness of the breath, as also an anxiety and palpitation of the heart, attended with a loss of strength, and a depression of the mind. A slight inflammation of the cœphagus, with a spasmodic stricture of the glands of the fauces, will cause thirst, dryness and blackness of the tongue. If the inflammatory congestion happens in the stomach, it will create a nausea, a reaching to vomit, and sometimes a hiccup. If in the intestines, there will be inflations grievously exasperating the disease, together with a colic, or a severe colic, or an ejection of fetid excrements. If in the vessels proceeding from the mesenteric arteries and veins, there will be a fixed pain at the first vertebra of the loins; if in the membranes of the spinal marrow, the patient will tumble and toss and lie irregularly in bed, and will have a torpor and languor of the limbs, sometimes attended with convulsions.

But all these symptoms never happen to all, nor is their violence constantly alike. Some distinguish this fever into the simple and putrid. The first is caused by a congestion of good blood in improper places. But when it attacks persons full of impure juices, who have been weakened by a preceding disease, confant anguish of the mind, excessive cotto, or inordinate living, the symptoms are much more grievous, with loss of strength, and the disease will continue till the fourteenth or the twenty-first day, sometimes with eruptions, dusky or black spots, with immediate danger.

If the cause is not violent, this disease will often disappear, merely by the benefit of nature, on the fourth, seventh, or eleventh days, with a large sweat or bleeding. At the nofe, and, though very seldom, by a flux of the belly, unless it has something of malignity.

When the disease is rightly managed in the beginning, that is on the first, second, and third day, with bleeding and cooling things, and gentle diaphoretics, it will end on the fourth. But if the bleeding is omitted, or is too little, it may continue till the fourteenth or seventeenth day, with the more grievous symptoms, as also a delirium: but it will terminate at last by a sweat or loosening.

When it proves fatal, the patient generally dies of a spesaceous inflammation of the brain, or other parts, as the stomach or intestines.

The intentions of cure are, 1. To free the vital parts from too great a congestion of blood, which will either dissipate a slight inflammation, or prevent a great one. 2. To appease the exsudation of the blood and the spasmodic affection of the system of the nerves. 3. To dissipate the stagnating and corrupted fluids, and to restore a free circulation of the blood, chiefly to the surface of the body. To answer the first intention, the patient must lose the blood.
blood freely. Then the organic of the blood must be appeased with diluents, acids, and nitrous compositions.

And certainly if any disease requires acids, and the juice of tart fruits, it is this, such as tamarinds, and the juices of currants, oranges, and lemons.

Take two pounds of water; rose-water, white sugar, and juice of oranges, of each one ounce.

The jelly of hawthorn made pretty thin, with the addition of orange-juice, sugar, and rose-water, will make a proper demulcent and cooling drink; or whey turned with juice of lemons or oranges.

To direct the motion of the blood to the surface of the body, gentle diaphoretics will be proper, such as the bezoard, or absorbent powders, sometimes alone, and sometimes with citron juice. Likewise infusions of the leaves of veronica, carduus, or carduus benedictus, with fennel-seed, drank in the manner of tea, especially to promote sweating on the fourth day, when the disease is like to terminate with this salutary excretion.

It will be necessary, whether this fever be simple or putrid, to keep the body open; for which purpose aclyster made of whey, honey, oil of sweet almonds, with a little nitre and salt, will be proper; for by this means the fistula of the intestinal fibres will be relaxed, and flatus will be discharged, which descend the colon. In the decline of the disease, when there are apparent signs of colic in the urine, a laxative of manna and cream of tartar, or calisca and rhubarb, will be of great use.

Of the Bilious Fever.

The bilious is a kind of a burning fever. It begins with intense heat, thirst, anguius, and inquietude. There is likewise a vomiting, or a perpetual reaching to vomit, with frequent bilious fluxes, a coldness of the extremities, internal heat, and cardialgic anxiety. This fever is either acute, or very acute. In this the symptoms are more violent, the bilious purging upwards and downwards is very plentiful, joined to a cardialgia with fainting. It generally kills before the seventh day, with an inflammation of the stomach and duodenum; the signs of which are, a fixed igneous heat about the precordia, with a coldness of the extremities, high inquietude and anxiety, a hiccup, and a plentiful erussion of bile and saliva liquor, a jaundice-colour of the countenance, and a hippocratic face.

Some are so acut, but run a greater length, with now and then a remission, and perhaps an intermission, and have an exacerbation, with vomiting, anxiety, and coldness every other day, or every third day, and ought to be called continual quotas or tertians.

It is caused by a bilious fluid secreted plentifully in the liver, and poured out into the stomach and duodenum, where by its acrimony and corrosiveness it stimulates the nervous tunic, corroding and inflaming them; whence the symptoms proper to this fever arise, such as a burning heat, a cardialgic anxiety, a nausia, a reaching to vomit, and a violent purging upwards and downwards.

Hoffman, in the cure of the bilious fevers mentioned by him, would have the caustic acrimony of the bilious juices abated and theadethed by absorbent powders and nitre, which should be taken in a sufficient quantity of a liquid, and often repeated. He likewise recommends emulsions of almonds, of the cold feeds; elder flower water, rose-water, &c. as also jellies of hawthorn, milk and water, oil of sweet almonds, sweet whey, chicken broth.

After these things, medicines must be given to restrain the impetuous bilious excretions, and to abate the too quick systaltic and peristaltic motion of the biliary ducts, and to prevent the too great excretion of the bile.

In the cure of the Bilious Fever of the camp, Pringle, before it becomes continual, depends on the proper use of evacuations, the neutral salts, and the bark. Bleeding is the first thing to be done in every case, and is to be repeated once or oftener, according to the urgency of the distemper. The vernal and later autumnal remittents are accompanied with rheumatic, pleuritic pains, and other symptoms of high inflammation, which require more bleedings than the intermediate season. To omit this, and give the bark too soon, will bring on an inflammatory fever. A vein may be opened falsely either during the remission, or in the height of the paroxysm.

After bleeding, give an emetic in the remission or intermission of the fever, and rather soon after a paroxysm than before one. But emetics do harm when the stomach is inflamed, or when the disease has continued some time, and has assumed the type of a continual fever. However, we may safely give one when the fever intermits, or has considerable remissions. Ipecacuana is safest, but antimonials most efficacious. If the remissions are small, or the fever great, or there is a tendency to vomit, the former is best. But when the remissions are dilate, or the remission perfect, the latter should be preferred; or it may be joined to the former; that is, two grains of tartar emetic, with a scruple of the powder of ipecacuana. Those vomits are best which produce floops, especially if they procure a plentiful discharge of corrupted bile upwards or downwards.

If the body continues coffive, a laxative will be proper, especially if there is a tenesmus, or pains in the bowels. The saline draught, with falt of wormwood and lemon-juice, will bring the fever sooner to regular intermissions.

Whenever the sweats are not profuse enough in proportion to the fits, the quantity of an ounce of jspir. Minedermi may be given, divided into two or three draughts, before they go off. It promotes a plentiful diaphoresis, without heating.

As the fevers are never without an inflammation in the beginning, and then rarely have complete paroxysms, the bark is not to be given till the urine breaks, and there are entire short intermissions; nor yet before bleeding, as was observed above; nor before the first passages have been cleansed; otherwise the fever will return, or a tympanites will be produced.

It is best to give the bark in subsidence in Rheinifh wine; or an ounce of it may be made into an eleuatory, with fyrup of lemons, and a dram of sal ammoniacum. If the patient has not been purged, it will be proper to add as much rhubarb as will keep the body open for the first two or three days of using that medicine. It is chiefly useful when the bilious humours abound, as they mostly do in marby countries. If the paroxysms are, or the
the intermissions short, it may be necessary to give the back before the sweating is quite over.

If the disease has been neglected in the first stages, or if after the remissions or intermissions it changes to a continual fever, with a full and hard pulse, a vein must be opened. But if there is a pain in the head, or a delirium, and the pulse small, it will be best to apply leeches to the temples. But whether the patient is bled or not, blisters are the best remedy. If the prime vis are loaded, cysts or a laxative may be proper; but neither vomits nor purges; nor are those to be repeated without caution. To these remedies the saline draught may be added.

Sweating is the proper crisis: it is never to be promoted by theriaca or volatile; but when the pulse sinks, and petechiae, or other symptoms appear, it will be proper to use the warmer alexipharmics, and to treat the disease like a malignant fever.

A loose end is the least favourable crisis: yet if there are colic pains, or a tension of the belly, attended with dryness of the skin, it will be proper to procure stools by a clyster, or a gentle laxative, such as the infusion of rhubarb with manna; which is to be repeated as the patient can bear it.

Of a Causus, or Burning Fever.

The principal symptoms of a causus are, a heat almost burning to the touch, most remarkable about the vital parts, but more moderate towards the extremities, which are even sometimes cold; the breath is extremely hot; there is a dryness of the whole skin, nostrils, mouth, and tongue. The respiration is thick, difficult, and quick; the tongue is dry, yellow, black, parched, and rough; the thirst is unquenchable; there is loathing of food, a nausea and vomiting; an anxiety, inquietude, and great languor; a little cough, a shrill voice, a delirium, a phrenzy, a continual watching or a coma, convulsions, and on the odd days an exacerbation of the fever.

In this temperate climate these fort of fevers are very rare; those that are more common among us are the burning, fanguineous, or the continual bilious fevers without remission.

This begins without any remarkable coldness or shivering, with great heat, thirst, watching, anxiety and inquietude. In fanguineo-bilious conflagrations, and in bodies full of hot bilious blood, they terminate in critical days in health or death, being first preceded with a shaking. They terminate in a salutary manner, with a sweat or a bleeding at the nose.

On the third and fourth day it often proves mortal; it seldom exceeds the seventh, if violent.

It is often terminated by an hemorrhage; which if small on the third and fourth day, it is a fatal sign. It is best if it happens on a critical day.

A solution of this fever on a critical day, may also be by vomiting, stool, sweat, urine, or spitting thick phlegm. If the exacerbation of this disease happens on the second or fourth day, it is a bad sign; on the sixth, not so bad.

The urine black, small in quantity, and thin, is fatal; so is spitting or piling of blood. A difficulty of swallowing is a bad sign; but the worst of all is coldness of the extreme parts. The face red and sweaty, is bad; a parotis not tending to suppuration is fatal; the body too loose is fatal. A tremor turning into a delirium is mortal: it often changes into a peripneumon with a delirium. When this disease succeeds gripings of the bowels, it is worst of all.

A critical determination of this fever is usually preceded by a rigor, or shaking.

The cure of a burning fever is most easily obtained in a pure, cool air, frequently renewed; The patient must not be oppression or lifted with bed-cloaths, but should fit up often. He should drink plentifully of soft, sub acid, aqueous, and warm liquors. His diet should be light, made of pearl barley, oatmeal, and sub-acid fruits.

Bleeding is necessary at the beginning, if there is a plethora, or signs of a particular inflammation, or the heat is intolerable, or the rarefaction too great, or a re-vulsion necessary, or the symptoms urgent, in which circumstances the disorder is hardly to be vanquished by any other remedies.

Soft, diluting, laxative, antiphlogistic cooling clysters, are to be repeated as oft as the heat, coughs, and revulsion require them.

The whole body is to be moistened by receiving into the nostrils the streams of warm water; by washing the mouth, throat, feet, and hands, with the same; by fomenting with warm fuppes the places where the vessels are most numerous, and most exposed to the touch.

The medicines should be aqueous, soft, nitrous, gratefully acid, gently laxative, not promoting sweat and urine by their acrimony, but by their plenty; such as remove the contraction of the fibres, resolve the thickness of the humours and dilute, and temper their acrimony.

To appease thirst in this disease, and to moisten the tongue and parched fauces, there is nothing better than sweet whey, in a quart of which half a dram of pure nitre has been dissolved. Small draughts of this, a little cool, may be drank frequently, which will likewise extinguish the pernarial heat. The mouth and throat may also be washed with water, mixt with syrup of mulberries and nitre.

Purgatives are dangerous before the crisis, but clysters may be used, made of milk, honey, and a little nitre. After the crisis, which is known by the sediment in the urine, laxatives made with tamarinds, manna, rhubarb, raisins, or cream of tartar, are absolutely necessary.

Of the Burning Bilious Fever, or Yellow Fever of the West Indies.

The yellow fever begins with a momentary chilness and shivering, which is soon succeeded by a burning heat all over the body, but is felt more intensely about the precordia. The pulse is high, strong, and rapid; the eyes are heavy; with a throbbing pain in the head, and a violent beating of the temporal arteries, and a thick, laborious respiration: There is a nausousness, and reaching to vomit; and when anything is thrown up, it is of the bilious kind: Besides these, great anxiety, pain in the back and loins, and an uneasy lassitude in all the limbs.

About
About twelve hours after the invasion, the tongue is dry, harsh, rough, and discoloured, with inextinguishable thirst; there is a foreboding all over the body, great restlessness, and a delirium.

In the last stage the patient labours under a great coma, oppression of the precordia, heaving of the lungs, an interrupted respiration, tremblings of the tendons, convulsions, and cold clammy sweats.

It usually terminates in a favourable crisis, or the death of the patient, about the fourth day after the attack.

The regular crisis generally discovers itself by a suffusion of the bile all over the surface of the body about the third day. The saffron tincture is frequently discovered in the eyes twelve hours after the invasion: the sooner it appears, the more favourable is the prognostic.

If the jaundice comes on too soon, it is bad; if with livid spots, which sometimes, though rarely, appear, it is fatal. If the skin continues obstinately dry and rough, the cafe is dangerous; and the more so, the longer it continues; for these very seldom recover, be the pulse ever so good. The pulse is not to be depended on; for many have a good pulse a few hours before death. If the vomitings are incessant, grow darker, and the hiccup comes on, it is generally fatal. If the face is greatly flushed, and the vessels of the white of the eye are turgid with blood, as in an opthalmia attended with a phrenzy, the patient is likely to die in a very little time, especially if the skin is dry.

But if the head continues in clear, the pulse becomes soft, the pains, nauseas, and anguishes are relieved by bleeding; and as the humours vomited are carried downwards by laxatives; if then the inquietude ceases, the skin grows soft and moist, and the patient has better spirits; it is probable he will recover.

Bleeding is the first thing to be done, more or less, according to the force of the disease and the strength of the patient; and if the symptoms continue in their full vigour, should be repeated once in six or eight hours, lessening the quantity proportionably each time.

After the first bleeding, give a vomit of ipecacuanha, quickened with three or four grains of emetic tartar, (or rather two grains,) which will bring up a great quantity of yellow, poraceous, and sometimes blackish bile, and carry the humours downwards.

After this the patient may drink plentifully of diluting, refrigerating, and subacid liquors, made with oranges, lemons, tamarinds, spirit of sulphur, spirit of vitriol, and such like, in barley-water, spring water, or other thin and cooling vehicles. He may likewise be allowed tartarjuicy fruits; as bananas, granadilloes, Barbadoes cherries, and water-melons; as also plantains, and bananas, roasted for food; jelly of guavas, &c.

Cooling tellaceous powders are likewise very beneficial.

Towards the evening it will be necessary to inject a clyster, made of the common decoction, with half an ounce of cream of tartar, an ounce of manna, or an ounce of pulp of caffia added to it.

When the operation of the clyster is over, paregorics will be proper, as thus:

*Take 2 ounces of mint-water, one ounce of cinnamon water, 25 drops of the tinctura thebaica, and a sufficient quantity of sugar.*

The room should be kept cool, and sprinkled with vinegar, rose-water, and cooling herbs. Fresh air should be admitted, but not to blow directly on the patient's body.

Blisters are also of great efficacy at this juncture; which if applied before it be too late, a coma, the deadly symptom of this distemper, very rarely ensues.

The patient's diet should be nothing but thin panada and water-gruel, gratefully sweetened and acidulated.

Besides plentiful and frequent draughts of cooling liquor, the patient should be allowed preferred tamarinds, slices of lemon with a little sugar; but above all, penguins, which by their sharpness penetrate the thick tenacious surf, whereby the glands of the mouth will be unloaded. Opiates must also be used in larger doses than in Europe.

Cooling and lenient clysters must also be repeated every eight hours.

When the patient begins to be comatose, the third and last stage of the disease is advancing; in which are, difficulty of breathing, oppression of the precordia, convulsive twitching of the tendons, interruption of the pulse, and at length its total cessation.

In this case, a complete set of blisters must be immediately applied, or the old ones renewed; which must be laid to the nape of the neck, on the wrists, thighs, and legs, and a large one on the crown of the head. To the soles of the feet may be laid a cataplasm of salt herrings and mustard.

With regard to the urgent symptoms; pains of the head, watchfulness, and deliria, are to be relieved by emollient and laxative clysters, gentle purgatives, cupping with scarification, opening the frontal vein, lotions of the feet, and narcotics.

Blisters are also useful for the same purpose.

Convulsions require much the same treatment externally; and internally, aurum nitricum, (the dose from four grains to a scruple.) To restore the strength of the patient, little more is required than a stomach purge or two, mild and agreeable bitters, and a restorative regimen of broths, jellies, and white meats.

If the yellow tincture remains upon the skin, give a vomit of ipecac, and a purge or two with the decoction of fennica, tamarinds. &c. and allow the use of lemons, oranges, and other acid fruits. If this disorder proves obstinate, treat it as the jaundice.

**Of the Senegal Fever.**

The fever which chiefly prevails in this country in the months of July, August, and September, is of the worst kind. It usually begins with drowsiness, latitudinal, and great rigors, which continue frequently three or four hours, and are succeeded by intense heat and sweats. For three or four days it remits, and both the shiverings and hot fits become more moderate. During this period, the pulse is quick and low; but afterwards becomes fuller, unless some evacuation intervene. At this time profuse sweats are easily brought on; in which case there are little hopes of recovery. A parched, dry skin, is as bad a symptom, if it continues more than a day; for an intermitt
Intermitting pulse and a delirium succeed, and continue for seven or eight days, the frequency of the intermissions increasing every day: but if a general moderate moisture comes one at this, or any other time of the disorder, and continues, the patient recovers. A violent pain in the head and back, and difficulty of breathing, are general complaints. Sudden languors, and bilious vomitings, are frequent through a great part of the time.

Some are taken with a great heat, and a strong quick pulse, without any shiverings or remissions, as above-mentioned. In this case the patient sooner dies upon the appearance of bad symptoms, and is longer in recovering upon the appearance of good ones.

The loss of eight or ten ounces of blood, in the first attack of these fevers, has sunk the pulse beyond a possibility of raising it afterwards, and that even in plethoric habits, attended with great pains of the head. It is, indeed, surprising how little these fevers will bear of evacuations of any kind, especially bleeding.

After profuse sweats, the pulse becomes extremely low; and, though the sweating goes off, continues for two or three days, with anxiety and restiflrefles after which the pulse grows quick, the skin parched and hot, and a fever of bad symptoms comes on.

The sick are always comatose and fluid; which symptom is little dangerous when attended with a warm moisture on the skin, but otherwise it is generally fatal.

It is of great consequence to keep up the pulse; but here the common cordial medicines are ineffectual; yet the decoction of the bark, with the camphorated julep, and spirit of vitriol, answers this purpose effectually, so as to render any other medicine unnecessary, except occasionally a gentle emetic or laxative.

Of the Inflammation of the Stomach.

The inflammation of the stomach is known by a burning, fixed and purgient pain in the stomach, which is exasperated at the instant any thing is taken into it; and is succeeded by a most painful vomiting and hiccup. There is always a violent internal heat, high anxiety, a grievous pain about the precordia, chiefly at the pit of the stomach, an acute, continual fever, great thirst, difficult breathing, inquietude, toffing of the body, coldness of the extremities, a conftant stimulus to vomiting, with inquietude: But the heat in the region of the stomach is not fo violent, nor is the thirst and dryness of the tongue so great, nor the pulse so quick and contracted, and the stomach can better bear and retain any thing taken inwardly; nay, is frequently relieved thereby. An inflammation of the intestines has a pain or gripes more about the region of the navel, with frequent, frothy, bilious stools, or a little bloody, with a heat over all the surface of the body, and a quick large pulse: Whereas in this disease the extremities are cold.

If it be caused by drinking cold liquors when the body is hot; or from an effusion of the bile after violent commotions of the mind; the danger is not very great, as there will be room for suitable medicines to take effect. But that which arises from draffic purges, sharp emetics, or caustic poisons, kills quickly without speedy assistance. This disease likewise often proves fatal to the old, the infirm, the scorbutic, and persons full of grief, as also in the end of acute diseases.

When there is a restless toffing of the body; when liquids are immediately thrown up; and when there is a hiccupp, a fainting, an hippocratic face, an intermitting pulse, and convulsions, a fatal mortification will soon terminate the patient's life.

This disease, if not suddenly cured, is generally mortal: And therefore, as soon as it is discovered, plentiful bleeding is necessary, and must be repeated as the violence of the symptoms increases. Let the drink be very hot, antiphlogistic, and emollient; as also clysters of the same kind.

The patient should totally abstain from every thing that is acrimonious; even the cooking, nitrous salts, which are beneficial in other inflammations, irritate too much. Vomits, cordials, and spirituous liquors, are little better than poison.

Aliments should be given frequently, and by a spoonful at a time; for any dilution increases the inflammation. A thin gruel of barley, oatmeal, whey, with very little sugar or honey, or chicken-broth, are proper aliments; whey-emulsions, barley-water, emollient decoctions, are proper drinks.

The indications of cure are, 1. To open the obstructions caused by tenacious juices impacted into incongruous vessels; 2. To remove the spastic strictures which contract the vessels, and to regulate the equable and natural progress of the blood through the substance of the stomach. These ends are to be obtained by diluents, humectants, demulcents, antiphlogistics, and things that restrain the heat which thickens the fluids, and relax the contracted fibres.

But as there are more causes than one that produce an inflammation, they will require different remedies to bring about a cure.

Therefore, if it be owing to a caustic, septic, arsenical poison, or a strong emetic or cathartic, or to metallic medicines ill prepared, and thence the inflammation; oily things are proper, as new milk, cream, oil of sweet almonds, or olive oil taken often and plentifully.

If from a spasm, succeeding a violent commotion of the mind, then a nitrous absorbent powder will be proper, in an emulsion of white poppy seeds. When the spasm is appeased, rhubarb with raisins will be necessary to carry off the bilious fords.

When an eruptive matter is repelled and causes this disease, use emulsions of the greater cold feeds, with temperate absorbents and hartshorn philosophically prepared should be given, with gelatinous decoctions of calves and neat's feet, or hartshorn jellies.
jeffies and water gruel. Outwardly, the following liniment is useful in all cases:
Take of oil of sweet almonds 2 ounces, and a dram of camphor; mix and make them into a liniment, to be applied warm to the fomach.

Of the Quinsey.
A Quinsey is an inflammation of the fauces, with a burning pain, tumor and redness; a difficulty of breathing or swallowing; and a fever, proceeding from a flatulence of blood, or a vicious acid serum in the fanguineous or lymphatic vessels.

It begins with a fever, which is followed with a pain and inflammation of the fauces, causing the uvula, tonsils, and larynx to swell; whence great difficulty of breathing and swallowing ensues.

This disease may be seated at the root of the tongue near the os hyoides; the foramina of the nostrils opening to the bone; the beginning of the oesophagus; the muscles of the pharynx; the internal and external muscles of the larynx; the greater and lesser glands; the tonsils, or the muscles moving the jaws.

When a quinsey affects the internal muscles of the larynx, and there is no outward redness about any part of the neck, but a burning pain inwardly, a loss of voice, and great difficulty of breathing; it often kills in twenty-four hours. This is called a hynanche. When it is seated in the internal muscles of the pharynx, it is called a fynanche; in which there is no external tumor and redness, but a great difficulty of swallowing and breathing, and whatever is drank returns through the nose. When there is an outward tumor and redness, and the external muscles of the pharynx are affected, it is a parafynanche; when the external muscles of the larynx, a parahynanche.

A quinsey is likewise distinguished into the true and spurious. The true arises from the flatulence of the blood; the spurious or ballard from a congestion of the serum. The former is acute, always attended with a rigor and a fever. The latter has rather a lymphatic or catarrhal, then an acute fever. The first has not only a burning, prickling pain in the inner parts of the fauces, but the tongue is turgid with blood, and of a dark reddish colour; the face is likewise red; there is a great pulsation of the temporal arteries; sometimes a head-ach, a torpor of the senses; sometimes fainting.

When it is very violent, there is a difficulty of breathing, high anxiety, and coldness of the extremities; and is very dangerous, requiring speedy help. But in the spurious, those symptoms are either absent, or more mild; nor is the danger so great.

This disease may be cauèd by a suppuration of some fistula fanguineous evacuation; by admitting the cold air after a strong fudorific has been taken; and by lying in rooms new plastered or white-washed. Some caustic poisons affect the throat more than other parts. White hellebore attacks the fauces, and brings on a strangulation. The same enflues from the solanum furiosum, and the bite of a mad dog. The fumes of arfecnical and mercurial minerals, as also the vapours of mineral spirits, will have the fame effects.

M E D I C I N E.
It sometimes comes on spontaneously, and is again the symptom of another disease, as the diarrhoea and dyentery, especially if the flux is halty stopped. It has happened from the striking in of an erysipelas; or sometimes from the gut being injudiciously treated with topicks; as also from the small pox, or a malignant or petillential fever. The cause of the symptomatic disease is collience, or suppurated perforation, or the striking in of eruptions. When it is epidemic, it has something of malignity.

When the swelling, pain, and redness, appear more outwardly, and vanish by degrees, it is a sign of a happy solution of the disease. But when the external swelling suddenly disappears, without a mitigation of the symptoms, it leaves the morbid matter to be tranflated elsewhere, and will change to a phrenzy or peripneumony. Or this disease may terminate in a suppuration or gangrene, or a schirrus. A frothing at the mouth, the tongue vally swollen, and of a purple, blackish colour, portends death.

In thes inflammations a slight diarrhoea relieves: Therefore aliments which promote it are useful, as tamarinds infuded in whey; decoctions of farinaceous vegetables moderately acidulated, and such as abound with a cooling nitrous salt, are proper. Burnet is said to be a specific in this case. Mulberries are beneficial, and all a-
cids.

The mouth and throat must be kept moist, and the nose clear, that the air may have clear passage through it. When the patient cannot swallow, he may be nourished by clysters.

Take away blood plentifully from the arm, and afterwards open a sublingual vein; but bleeding in the jugular yields the best assistance, and is much more safe. If the symptoms continue to be very urgent, the bleeding may be repeated in fix or eight hours time, till they begin to be more mild.

After the first bleeding, lay a strong and large blister on the fore-part of the neck, or a piece of flannel dipp'd in the volatile liniment.

Then let the parts inflamed be touched with the following mixture:

1. Take a sufficient quantity of honey of roses and spirit of sulphur. Mix them.

Then the following gargar is to be used, held in the mouth till it is hot before it be spit out; which is to be repeated pretty often:

2. Take a pound of barley-water, 8 ounces of honey, and 2 drams of spirit of sal ammoniac. Mix them. Emollient steams, or even the steam of hot water taken in at the mouth, are beneficial.

If the patient is not able to swallow any nourishment, the same, or even the steam of hot water taken in at the mouth, are beneficial.

If the patient is not able to swallow any nourishment, the same, or even the steam of hot water taken in at the mouth, are beneficial.

3. Take ten ounces of beef-tea, 10 grains of nitre, and 6 drops of spirit of salt. Mix and make them into a clyster.

Let it be injected every eighth hour, after the belly has been cleansed with a purging clyster.

If the tumour tends to a suppuration, it is best promoted by holding hot, dried figs in the mouth; and when the tonsils are full of an inflammatory ichor, honey of roses mixed with spirit of vitriol, and often applied to the part with a pencil, is excellent.
That inflammatory pain which arises from a sharp salt serum in the glandulous parts of the fauces, with redness, and a copious flux of saliva, but without a fever, may be cured with a gargle of brandy alone. An inflammation of the fauces is sometimes cured with ten drops of camphorated spirit of wine, in which a grain of nitre has been dissolved, and suffered to pass slowly down the throat.

The acute and inflammatory quinsy may be defined, "An inflammation of some part or parts, either within or contiguous to the throat, rendering deglutition painful, and impracticable; and, when it is of the most dangerous kind, likewise affecting respiration."

When only swallowing is impaired, the parts inflamed may be the tonsils, the velum palati, and uvula, the muscles of the pharynx, and thofe of the larynx, which raise it or pull it down in deglutition, but whose action is not concerned in moderating the aperture of the glottis; while the larynx itself and the aspera arteria remain free.

But when the respiration is pinched, beside other parts, thefe muscles, which are employed in opening and shutting the glottis, must be inflamed; and likewise, probably the inner membrane of the larynx, and thofe muscles and fibres that join the rings of the aspera arteria together: And sometimes these minute and remote parts are affected without any redness or tumour. either within the fauces, or outwardly on the throat: This kind of quinsy is the most dangerous and suddenly destructive of all.

The practitioner in every kind of quinsy ought to look carefully into the mouth and fauces, in order to discern where any redness and tumour is; that by comparing the appearance of the parts with the functions impaired, he may be enabled to form the better judgment with respect to the seat of the disease, the prognostic, and method of cure.

If the breathing is remarkably affected, there is absolute necessity of applying all the most efficacious remedies with the greatest briskness and speed possible. These are plentiful and repeated bleedings, a large blister between the fauces, or outwardly on the throat: This kind of the malignant quinsy, or putrid sore throat.

This disease generally comes on with such a giddiness of the head, as often precedes fainting, with a chilliness or shivering like that of an ague fit, followed by great heat; and these alternately succeed each other for some hours, till at length the heat becomes conflant and intense. The patient then complains of an acute pain in the head, of heat and forenefs, rather than pain, in the throat; thickenings of the neck; commonly great fickness, vomiting or purging, or both. The face soon after looks red and swelled, the eyes inflamed and watery, as in the meatus; with rellife of throats, anxiety, and faintnefs.

It frequently seizcs the patient in the fore-part of the day: and as night approaches the heat and rellife of throats increafe, continuing till towards morning; when after a short, disturbed flumber, the only repose during several nights, a sweat breaks out, which mitigates the heat and rellife of throats, and gives the disease sometimes the appearance of an intermittent.

If the mouth and throat be examined soon after the first attack, the uvula and tonsils will appear swelled; and thofe parts together with the velum pendulum palati, as well as the cheeks on each side, near the entrance into the fauces, and as much of the fauces and the pharynx behind as can be seen, appear of a florid red colour. This colour is commonly most observable on the posterior edge of the palate, in theangles above the tonsils, and upon the tonsils themselves. Instead of this redness, a broad patch, or spot, of an irregular figure, and of a pale white colour, surrounded with a florid red, is sometimes to be seen. This whitenefs is commonly like that of the gums after having been pressed with the finger; or as if a matter ready to be discharged lay underneath.

Generally on the second day, the face, neck, breast, and hands, are of a deep erysipelatos colour, with a sensible tumefaction. The fingers are fo frequently tinged in a remarkable manner, that it has been no hard matter to guess at the disease from a bare sight of them.

A great number of small pimplles of a more intense colour than that which surrounds them, appear on the arms and other parts. Where the redness is least intense, they are larger and more prominent, which is generally on the arms, breast, and lower extremities.

As the skin becomes red, the sickness commonly goes off, and the vomiting and purging cease.

The appearance in the fauces continues the same, only the white place becomes of a more opake white, and is discovered to be a slough, concealing an ulcer of the fauces dimensions. These ulcerations are generally first discernible in the angles above the tonsils, or on the tonsils themselves. They are also often seen in the arch formed by the uvula and one of the tonsils; on the pharynx behind, on the inside of the cheeks, the basin of the tongue, which they cover like a thick fur. Where the disorder is mild, there is only a superficial ulcer, of an irregular figure, in one or more of thofe parts, scarce to be distinguided from the found part, but by the inequality of its surface. Likewise the redness and eruption do not always appear, and in some not till the third, fourth, or fifth day, or later.
The parotid glands on each side commonly swell, grow hard, and are painful to the touch; if the disease is violent, the neck and throat are surrouned with a large oedematous tumour, sometimes extending itself to the breast, and by straitening the fauces increase the danger.

Towards night the heat and restlessness increase, and a delirium frequently comes on. This happens to some on the first night. It is very remarkable, that the patient commonly returns a proper answer to any question, but with unusual quickness; yet when they are alone, they generally talk to themselves incoherently. However, at the first tendency to this disorder, they affect too great a compofure. This for the most part happens to those that sleep but little; for some are comatose and stupid, and take but little notice of any thing that passes.

They continue thus for three, four, or more days, commonly growing hot and restless towards the evening. These symptoms and the delirium increase as the night comes on: a sweat, more or less profuse, breaks out towards morning; and from this time they are eaiser during some hours, with a faintness, which is their chief complaint.

Some grow easier from the first day of the attack; others have symptoms of recovery on the third, fourth, or fifth day. First the redness of the skin disappears; the heat grows less; the pulse, bitherto very quick, becomes slower; the external swellings of the neck subside; the floughs in the fauces are cast off; the ulcerations fill up; the patient sleeps without confusion, is composed when awake, and his appetite begins to return towards more solid nourishment.

The pulse, during the course of this disease, is very quick, beating frequently 120 times in a minute. In some it is hard and small, in others soft and full, but not so strong and firm as in genuine inflammatory disorders.

If a vein be opened soon after the distemper comes on, the blood generally appears of a fresh and florid red; the effusion is rather of a lax, gelatinous contexture, then dense or compact; the serum is yellow and in a large proportion.

The urine is at first crude and of a pale whey colour; as the disease advances it turns yellower, as if bile was diluted in it; and soon after any signs of recovery appear, it commonly grows turbid, and deposits a farinaceous sediment.

They seldom have any stools if the symptoms are favourable, from the time the purging, which generally attends the accension, ceases. This discharge is remarkably bilious, yet without pain.

The thirst is commonly less than in other acute diseases; and the tongue generally moist, but not furred. Some have it covered with a thick white coat, and complain of soreness about the root of the tongue.

Though the uvula and tonsils are sometimes so much swelled as to leave a very narrow entrance into the gullet, and this entrance frequently surrouned with ulcer, or floughs; yet the patient swallows with less difficulty and pain than might be expected. Soon after they are taken ill, they frequently complain of an offensive purid smell, which often occasions sickness before any ulcerations appear. The inside of the nostrils, in those that have this disease severe, frequently appears, as high as can be seen, of a deep red or almoft livid colour. After a day or two, a thin corrosive fainey, or with it a white putrid matter, of a thicker conftitution, flows from it, so acid as to excoriate the part it lies upon any considerable time. This is most observable in children, or in young and very tender subjects; whose lips are likewise frequently of a deep red, or almoft liquid colour, and covered on the inside with vesicles containing a thin ichor, which excoriate the angles of the mouth and cheeks where it touches them.

This acid matter seems to pass with the nourishment into the stomach, especially of children; for if they get over the disease, a purging succeeds, yet attended with symptoms of ulcerations in the bowels; thefe, after great pain and misery, at length die emaciated.

The patients sometimes bleed at the nofe towards the beginning of the disease; and the menfes often appear in the female sex, if they are of age, soon after they are feized, though at a distance from the time of their regular period. It brings this evacuation upon some that never had it before. This flux, in full strong habits, is seldom attended either with benefit or with manifest ill effects, unless very copious; yet sometimes it occasions great faintness, and an increafe of the other symptoms. Hemorrhages of the nofe and mouth have carried the patient off suddenly; but this does not happen till several days after the attack; and perhaps may be owing to the separation of a flough from the branch of an artery.

Children and young persons are more exposed to this disease than adults; girls more than boys; women more than men; and the infirm of either sex than the healthy and vigorous. Very few grown people have it. When it breaks out in a family, all the children are commonly infected with it, if the healthy are not kept apart from the sick. And such adults as are frequently with them, and receive their breath near at hand, often undergo the same diseases.

With regard to the cure, bleeding is generally prejudicial. Some admit of it at the first attack without any sensible inconvenience; but a repetition of it in the mildfeet caffes seldom fails to aggravate the symptoms; it has sometimes produced very fatal consequences. It increafes the heat, restlessness, delirium, and difficulty of breathing; nor do the swelling of the fauces, tonsils, &c. receive any benefit therefrom. On the contrary, though the fullness of these parts decreases, yet the floughs thicken and change to a livid black colour, the external tumour grows large, and the spitting commonly diminishes. Indeed, the heat and quickness of the pulse may seem to abate at first by this evacuation; but they commonly return with greater violence, the patient is feized with a difficulty of breathing, falls into cold sweats, a flapor, and dies suddenly.

Nor is purging more beneficial; even gentle cathartics have brought on very dangerous symptoms. Upon procuring a few stools with manna, especially when the disease has continued two or three days, the redness of the skin has disappeared, and the flux to the throat has been surprisingly increased. If this discharge by stool continues,
tinues, the swelling of the neck commonly grows larger, the fauces become flaccid, dry and livid; and the patient a few hours after this expires.

Nitrous cooling medicines frequently produce the like effects; they increase the faintness which accompanies this disease, and either dispose the patient to copious sinking sweats, or floods.

Upon the whole, it appears, that all evacuations which tend to lessen the natural strength of the constitution, are injurious; and those persons are commonly in the greatest danger who have been previously indisposed, or their strength impaired by grief.

If the purging, therefore, continues long after the first exacerbation of the disease, it is a dangerous symptom; for though it may sometimes be restrained for the present with opiates or astringents, yet it commonly returns with greater vehemence when their efficacy ceases, and in a short time exhausts the small degree of strength remaining. In this case they generally sweat very little; the fauces appear dry, glossy, and livid; the external tumour grows large; they void their excrements without perceiving it, and fall into profuse sweats; the respiration becomes difficult and laborious, the pulse sinks, the extreme parts grow cold, and death, in a few hours, closes the scene. The eye loses its lustre, and becomes opaque and dim, sometimes several hours before death.

A copious flux of putridous matter to the glands and other parts about the fauces, have seemed sometimes to be the cause of sudden death.

It is necessary that the patient should be kept in bed as much as may be, though the disease should seem to be slight; for a purging has come on for want of care in this respect, the redness of the skin disappeared, and a disfigurement of superficial or penetrating, ulceration of a greater or lesser depth, as the sloughs are successively separated; since, whenever they come off, they leave an ulcer of a greater or lesser depth, as the sloughs are superficial or penetrating.

The thin, acid ichor, which is discharged from under the sloughs, often proves of bad consequence, especially to children. If gargles are injected, they either prevent them from reaching the seat of the disorder with their tongues, or they swallow them and the putrid taint of the ulcer together; whence fatal purgings ensue, or fatal hemor rhages from the penetrating gangrene. Those that have a plentiful discharge from the fauces, carrying off this ichor, are seldom attended with sickness, vomiting, or excessive faintness; and where there is little or no discharge, the symptoms are commonly most dangerous.

Hence the great advantage of gentle stimulating aromatic gargles appears; because they promote the discharge of putridous matter, and, doubtless, some part of the corrosive fluid along with it. To which, if we add antiseptics and detergents, to check the progress of the mortification, and to cleanse the fordid ulcers, every indication will be answered.

When the disease is mild, the symptoms favourable, the sloughs superficial, order a gargle of sage-tea, with a few rose-leaves in the infusion. Three or four spoonfuls of vinegar may be mixed with half an ounce of the tea, with as much honey as will make it agreeably acid.

If the sloughs are large, and are cast off slowly, they may be touched with mel egyptiacum, by means of an armed probe.

It is not uncommon for hectic fevers, night sweats, want of appetite, and dejection of spirits, to attend those a considerable time who have had the disease in a severe manner. Aftes milk commonly relieves them, together with a decoction of the bark and elixir vitrioli.

The caufe of this disease seems to be a putrid virus, or missna sui generis, introduced into the habit by contagion, principally by means of the breath of the sick person.

The intentions of cure in this disease is to keep up the vital heat; to encourage the cuticular discharges; and to conquer the spreading putrefaction. Therefore, all evacuations which lessen the strength, particularly bleeding and purging, and all the nitrous antiphlogistic medicines, are highly improper.

And since a laxity of fibres predisposes persons to receive this disease, it is manifest, both with regard to the preservation and cure, that tonic medicines are indicated; and among these the bark judiciously claims the first place.
The only certain diagnostics of this disease are aphthous ulcers and sloughs on the tonsils and parts about the pharynx.

Melt perforns in the beginning have a nausea and vomiting, and some a looseness. Those who are coughive, have, upon the use of the genttle ecpoptes, immediately been feized with a diarrhoea, difficult to restrain. All medicines which tend to move the belly, not excepting rhubarb, are extremely dangerous.

Those who have had the disease with most violence, have had the head always heavy and stupid, and the eyes foul and full of tears. Not a few have had the head covered with petechie and purple spots.

The first thing to be done is to order the hot stream of a boiling mixture, of vinegar, myrrh, and honey, to be received into the throat, through an inverted funnel. If it is necessary to make it still more penetrating, add some of the spirit. Mindereri. This steam can scarce be used too frequently, provided it is received with a due degree of heat.

If the prime vie seem foul, or much loaded, it may be necessary to begin the cure by cleansing the stomach with carduus tea, in which a little sal vitrioli is dissolved, and some other gentle and quick emetic. No other medicines which tend to move the belly, not excepting rhubarb, are extremely dangerous.

When it does, and is violent, it often ends in madness; for a phrenzy is to be distinguished from that flight alienation of mind which happens in acute fevers before the critical eruption. This goes off readily, nor is the urine thin and watery, nor is it attended with a rigor and a refrigeration of the external parts. It is also to be distinguished from a deipience and raving, from a great lofs of strength and weakness of the brain after the declination of an acute fever; for this will go as the strength returns, either spontaneouly, or with proper remedies.

Both kinds, when present, have the following symptoms:

A deprivation of the ideas of sensible things, as also of the faculties of the mind and affections; an unruly fierceenefs and wildnefs; an unquiet and often turbulent sleep, a light degree of folly, watching, fadness, fierceenfs, sudden forgetfulness, a gathering of threads from the bedcloaths.

Therefore plentiful bleeding is necessary, through a large inflammatory pain within the head, a redness of the eyes and face, unquiet and troubled sleep, a light degree of folly, watching, sadness, fierceenfs, sudden forgetfulness, a gathering of threads from the bedcloths.

A symptomatic phrenzy succeeds any acute disease; but it is worst when it is preceded by an inflammation of the pleura, lungs, or diaphragm. A black tongue, an obstinate coltiveness, suppression of urine, white fieces, which is always a fatal sign, pale, discoloured, thin urine, a wildnefs in the looks and actions, with a red vifage, a black cloud in the urine, and watching, are signs of an approaching inflammation in the head.

The symptomatic phrenzy sometimes appears in the state of malignant, eruptive, and spotted fevers, the small-pox, malignant catarrhal fevers, camp-fevers, particularly the Hungarie. It generally supervenes about the critical days, with a rigor, trembling of joints, tenion of the precordia, and coldness of the external parts, with thin urine. The patient being weakened with the preceding disease and long watching, which debilitates the tone of the vefels of the membranes of the brain; whence the ftares are not to be resolved, and whence the patient is generally killed on the third day.

A phrenzy is to be distinguished from that flight alienation of mind which happens in acute fevers before the critical eruption. This goes off readily, nor is the urine thin and watery, nor is it attended with a rigor and a refrigeration of the external parts. It is also to be distinguished from a dejipience and raving, from a great los of strength and weakness of the brain after the declination of an acute fever; for this will go as the strength returns, either spontaneouly, or with proper remedies.

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sults, as water gruel acidulated; the drink, barley-wa-

ter, small-beer, or the decoction of tamarinds.

A phrenzy is generally fatal on the third, fourth, or

feventh day; which last it seldom exceeds.

When it does, and is violent, it often ends in madness; which increasing gradually, the patient becomes raving mad.

The aliment ought to be flender, of farinaceous sub-

stances, as water gruel acidulated; the drink, barley-wa-

ter, small-beer, or the decoction of tamarinds.

This disease, of all others, requires the speediest ap-

lications. Profuse hemorrhages of the nose often resolve it; and copious bleeding, by opening the temporal arteries, is the most efficacious remedy.

The cure of this disease requires diligent attention to the following things:

Varices of the veins, or the bleeding piles, are beneficial.

A looseenfs is likewise good.

A pain in the breast and feet, or a violent cough supervening, often put an end to the disease; as also an hemorrhage.

Therefore plentiful bleeding is necessary, through a large
large orifice; or open several veins at the same time, eiz.
the jugular, the frontal, and a vein in the foot.

Hoffman prefers the bleeding at the nofe, procured by
thrufhing up a fhrow, a pen, or a faber; or, as Prin
gle advises, apply fix or feven leeches to the temples.
The refi of the cure confifts in blifters, and things com-
mon to other inflammatory fevers.

The cure of the fymptomatie phrenzy, if the pulfe
will bear it, is by opening a vein; but if this cannot be
done by reafon of great lowness, it is to be attempted by
leeches and blifters. It is usual to begin with bliftering
the head, but in military hospitais that is to be left to the
laft. The beft internai medicines are nitre and camphor.
Hoffman's proportion is fix grains of nitre to one of
camphor; small doxes of which are to be often repeat-
ed.

The patient's drink fhould be sweet whey, or acidula-
ted by turning the milk with citron or lemon juice, and
sweetened with fyr. e meconio. To every quart add a
dram of purified nitre or fal prunella. Also emulions
are convenient, of the four cold feeds, with barley-water,
to every quart of which add two fcropules of nitre.

Antiphlogiftic clyfters are likewise proper: but if all
these means fail, recourse muft be had to cupping in the
lower parts, to opiates, and mild blifters.

Of the Pleurisy.

The pleurisy is moft predominant between the spring
and the summer.

It begins with chilnefs and fhivering, which are foon
succeeded by heat, thirft, inquietude, and the other com-
mon symptoms of a fever.

After a few hours the patient is feized with a violent
pricking pain in one of his fides, about the ribs; which
sometimes extends itfelf towards the fhoiuler-blades,
sometimes towards the back-bone, and sometimes towards
the fore-parts of the breath; and this is attended with
frequent coughing.

The matter which the patient fhews at firft is little and
thin, and mixed with particles of blood; but as the dif-
eafe advances, it is more plentiful and more concocted,
but not without a mixture of the blood.

The fever keeps an equal pace with the cough, pain,
and spitting of blood; and in proportion as the expec-
toration becomes more free, it fenfibly decreases; fome-
times the body is coflve, fometimes too open.

The blood drawn from a vein, as foon as it is cold, looks
like melted feet.

In this difeafe the pulfe is remarkably hard, and feems
to vibrate like a tenfe fhring of a musical ftrument, which
is the pathognomonic fein.

Hence pleurifies are diftinguithed into the moif and the
dry. It is likewife obfervable, that the pain in the fide
is more intenfe at the time of inspiration, but more mild
at the time of expiration.

There is no fever wherein the crifes are more regular
than in the pleurisy and peripneumony: for in young pe-
ople, and thofe of a full habit of body, bloody fhpirit ge-
nerally appears on the fourth day, and on the feventh the
difeafe terminates by a profufe feat. But in the phleg-
matic and more inactive, as alfo thofe in whom the difeafe

has taken deeper hold of the lungs, it will continue till
the eleventh or fourteenth day; going off partly by ex-
pectoration, partly by feat: then the pulfe becomes
more fof, and the patient falls into an eafy refreshing
feep.

But when on critical days the crifes is imperfect, there
is indeed a feat; but it neither eafes the patient, nor
terminates the difeafe. When it continues till the twenty-
fiuft day, there is reafon to fear a dangerous abfecfs in
the breath. It is therefore a good fign when the expec-
toration proceeds from the bottom of the lungs, bringing
up a vficid matter on the fourth day, mixed with blood,
afterwards yellow, and fometimes purulent. The sooner
the expectoration happens, the greater the hopes of re-
cover.

A loofenefs is not fafe; urine without a fediment is a
fufpectfed fign; and a profufe feat, unles on critical
days, is still worfe. On the eleventh and twelfth days a
loofenefs is not much to be feared, unles too great, for
it fometimes carries off purulent matter. If a bleeding
at the nofe happens about the fourth day, it is generally
attended with a remarkable alteration of the difeafe.

Those who die of an inflammation of the lungs are fuf-
cated, becaufe the matter adhering to the vehicles and
bronchial duffs cannot be coughed up.

In all inflammatory fevers, too hot a regimen is to be
flunned, both with refpeft to the bedcloaths and the heat
of the room; nor muft the patient be expofed to the cold-
air, nor drink things actually cold. Likewife all ftrong
fudorifics, diuretics, and cathartics, are hurtful. Nor, if
the patient has three or four ftools, muft the courfe of
nature be flopped.

The Diet fhould be cooling, relaxing, flider, and
diluting. Moistening things taken warm are preferable
to all others. Hence, barley oroat meal gruel, sweeten-
ed with honey, is proper; as alfo fweet whey.

The indications of cure are, 1. To prevent the farther
flaffs and dilatation of the blood. 2. To dilute and dif-
solve the fentor of the blood in pleuritics. 3. To mol-
lify, cafe, and relax the fpamin, pain, and copious aflux,
in order to put the impacted blood again into motion by
the help of the appulfe of the arterial blood. 4. To pro-
mote the excretion of the vficid, bloody, and purulent
matter, adhering to the bronchia of the lungs, fo that it
may be brought up and an abfecfs prevented.

Take away ten ounces of blood on the side of the part
affected. If the phyfician is called before the third day,
the patient lying on his back, muft lofe a large quantity
of blood from a wide orifice in a large vefsel, and fetch
deep fhights, or cough, to promote its cerelrity; and the
part affected fhouid be rubifhed gently at the fame time.

The bleeding fhould be continued till the pain remits, or
the patient is ready to faint. It fhould be repeated as often
as the symptoms return which it was intended to remove.

The abfence of the white inflammatory pellicle from the
surface of the blood, when cold, fhews it is time to leave it off.

This Huflham confirms by his own experience; and adds,
that after the fourth day bleeding is not fafe. He like-
wife recommends fomenting the part; which often eafes
the pain, and terminates the difeafe. But if it is obli-
mate, he recommends flight fcarifications; then cupping;

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and afterwards a blister on the same place, which has been successful when the usual methods failed. An emollient cooling clyster should immediately succeed bleeding, especially if the body is collic; and nitrous medicines, with a cooling, emollient, diluting regimen, should be forthwith entered upon. Thin whey, a decoction of barley and red poppies, and emulsions, will serve for drink.

Though the symptoms should vanish on blistering, it will be more secure to bleed again; unless a profuse sweat comes on with relief from pain, and makes all other remedies unnecessary. But if the lungs are likewise inflamed, the cure cannot be so speedy; for though the first bleeding and a blister should give ease, yet a repetition will be needful. Sometimes the blister returns and fixes on the other side; but this may be treated as the first with the same success.

Huxham says a great reliance on camphor and nitre joined with small doses of the paregoric elixir; and if there is a vehement pain, he thinks opiates may properly be joined with them, as they have a great power of relaxing the over tense fibres, of moderating the too rapid course of the blood, and of promoting the concoction of the morbid matter. Hence, after the use of opium, there is generally a copious sediment of the urine.

It is necessary that the body be kept open, and the bowels free from spasms; to which purposes emollient clysters are proper, with oil of sweet almonds.

In the first stage of the pleurisy or peripneumony, laxative clysters and the cooler diaphoretics are proper; but all cathartics and warm sudorifics do harm. The time of attending the diaphoretics is when the person finds ease by the blister: But whenever the spitting begins, the diaphoretics must either be omitted, or joined to expectorants; whereas the chief is oxymel of squills; or, in great heat or drought, some more pleasant acid. But in lowness, after repeated bleedings, give salt of hartshorn joined to some oil: This will raise the pulse, and promote expectoration when it fails.

If, notwithstanding the discharge, the breath continues to labour, bleeding is still requisite: For the lungs are not to be overpowered by the omission of bleeding; nor is the suppression of the spitting to be hazarded by bleeding too freely. But with regard to blisters, there need little caution; as they are always efficacious, to raise, relieve the breast, and to promote expectoration.

In the course of expectoration, a vomit will sometimes be useful in discharging the load of viscid phlegm. If the phlegm is tough, or the patient collic, and opiates are given, they must be joined with squills.

When the pleurisy ends in a suppuration, or abscesses, the signs are, a slight vague shivering, which often returns without any evident cause; a remission of the pain, while the difficulty of breathing remains; a redness of the cheeks and lips; thirst; a febricula, or slight fever, especially in the evening; a weak, soft pulse.

When the abscess is actually formed, there is an obliate dry cough, which increases after feeding or motion; the breathing is difficult, small, thick, short, and wheezing, worse after eating and motion; the patient can only lie on the side affected; a flow, periodical fever, which is exasperated with stirring and eating; a decayed appetite, great thirst, nocturnal sweats, paleness, leannees, and excessive weaknesses.

This either ends in a consumption; or the matter falls into the cavity of the thorax, and so becomes an empyema.

Of the Bastard Pleurisy.

Hoffman says, that the seat of every genuine pleurisy is in the lungs, as appears from the opening of those that die of this disease.

Therefore, if the inflammation occupies the external parts only, it is a Bastard Pleurisy: if the external surface of the lungs, like an erysipelas, it is a genuine pleurisy.

A Bastard Pleurisy is attended with a very acute and pricking pain in the side, which is exasperated by the touch; lying on the affected side is difficult; there is a dry cough, without the ejection of purulent or bloody matter, which, if strong, increases the pain. There is likewise a fever, with a hardish, depressed, and frequent pulse.

The cause does not seem to be in the blood, but rather in the vessels of an acrid serum at the conjunction of the ends of the fine azygous arteries and veins; as also of the lymphatic vessels of the pleura, and likewise in the perifleum of the ribs, where the senfe is more acute.

Hence it is nothing else but a kind of rhumatism, and is common to those who are now and then troubled with catarrhs, rheumatic and arthritic pains, or a hemorhania; especially if they come out of a hot air into a cold, or the contrary, particularly in the evening.

This does not require bleeding, unless there is a remarkable plethora; but a diaphoretics, and a more free perspiration. On the seventh day it generally disappears, and is without danger.

Lancifius advises to bleed plentifully in the arm, and to scourify the part affected. After this two cupping glasses are to be applied thereto, which will cure the disease as if by enchantment.

Hoffman observes, that those are apt to fall into a bastard pleurisy who are much exposed to a moist cold autumnal or wintry air: For there are no diseases or inflammatory fevers so soon generated by the intermecries, inequality, and change of the air, as those of the throat. When the summer has been hot and dry, and the weather has suddenly changed to cold, with a northerly wind, not only cartarhal defluxions have ensued, but rheumatisms and pleurises, with bloody spittle and violent pains in the side, have been very frequent. For the air, from continual inspiration, immediately affects the lungs internally, and externally the thorax and ribs, which are beset with thin muscles, membranous nerves and vessels; for which reason spastic crifpatures are readily induced; and the free circulation of the humours flot.

The best way is to keep the part affected in a temperate and equal heat, in a warm bed; especially as the skin of every patient, as in the gout and erysipelas, cannot bear topics.
**MEDICINE.**

*Of a Peripneumony.*

There are several kinds of this disease. For it may arise from a violent inflammation of the lungs, by a very fizy, dense blood obstructing very many of the pulmonic and bronchial arteries; or from an obstruction of the lungs by a heavy, viscid, pituitous matter; which is called a spurious or bastard peripneumony: or from a thin, acrid fluxion on the lungs; and then it is a catarrhal peripneumony.

The symptoms common to all, are, a load at the breast, a short difficult breathing, and more or less of a fever. But in a true peripneumony, there is a more tenfive pain than in the pleurisy; besides, it is rather more obtuse and pressuring than acute, and shoots as far as the back and scapula. But the difficulty of breathing is greater, as well as the anxiety and expectoration, whereby a variegated spittle is brought up, which lay as it were deep: for in this disease the vessels of the lungs themselves, whereby the blood circulates from one ventricle of the heart to the other, are affected; being stuffed and obstructed with a thick blood, which is apt to grow more viscous and solid. Wherefore it is the more dangerous and fatal, especially if it attacks old persons, and if bleeding is not timely administered. Boerhaave says, the pulse is soft, slender, and in every sense unequal: and Huxham, that if the pulse is hardly felt before bleeding, it will afterwards beat very strongly.

In the cure, great regard must be had to the different stages of this disease, and the different symptoms that attend it. Bleeding is indispensably necessary at the beginning of a severe inflammation of the lungs; but if, after the second or third bleeding, the patient begins to spit a well-concocted matter, freely tinged with blood, you must forbear to repeat it, otherwise the patient will be weakened, and a fatal suppression of the expectoration will ensue. But if he brings up a considerable quantity of florid, thin, spumous blood, by spitting; then bleed again, quiet the cough with diacodium, and give proper acids pretty freely, with soft cooling incipients. If a thin, gleetly, dark-coloured mater is expectorated, it is generally a mark of greater malignity, and that the blood is in a putrefying dissolving state, and will not bear a large loss of blood.

Generally the more violent the rigor or horror is at the attack, the more violent the succeeding fever will be, which will in some measure guide us in drawing of blood. If the symptoms are not relieved by the first bleeding, after eight, ten, or twelve hours, let it be repeated; or sooner, if they become aggravated. If the fever, anxiety, oppression, and difficulty of breathing, increase, bleed again, especially if it appears very firm and dense, or covered over with a thick yellowish coat or buff. However, it does not appear sometimes till the second or third bleeding, though the symptoms indicate a very high inflammation. This often happens from the blood not spouting out in a full stream. This appearance of the blood, with a firm strong pulse, will warrant the taking away more, till the breathing becomes free and easy.

If the craffamentum is of a very loose texture, and not covered with a buff coat, and the pulse on bleeding sinks, flutters, or grows more weak and small, it is time to defist. A bluish film on the blood, with a kind of a soft greenish jelly underneath, while the crust itself is livid, loose and soft, with a turbid, reddish, or green serum, is a sign of a very lax crust of the blood, and great acrimony, which will not bear great quantities to be drawn off. If the blood is very florid, thin and loose, with little or no serum after standing for some time, it generally argues a considerable advance to a purulent and very acrid state.

A strong, throbbing, thick pulse, always indicates farther bleeding; at least till the patient breathes more easily, or a free expectoration of laudable matter is obtained. It often happens, that the pulse at the very beginning seems obscure and oppressed, irregular, sluggish, and sometimes interrupting, with weakens and oppression. But this does not arise from the defect, but from the too great quantity of blood; for the blood-vessels being over-loaded and diffused, cannot act with sufficient vigour. This is succeeded with a dreadful train of symptoms, and even death itself, if not prevented with sufficient bleeding.

In some very violent peripneumonies, an immediate and excessive weakens comes on, with an inexpressible anxiety and oppression of the breath; a very small, weak, trembling pulse, coldness of the extremities, with clammy, coldish, partial sweats, the eyes flattering, fixed and inflamed, the face bloated and almost livid. This has soon been followed with a florid, delirium, and sometimes with a complete paraplegia.

Some kinds of peripneumonies will not bear large bleeding, especially the epidemic or malignant. The pulse and strength of these patients have funk to a surprising degree; and the disease has turned into a sort of a nervous fever, with great tremors, subfulbus tendinum, profuse sweats, or an atarabulous diarrhoea, with a black tongue, coma, or delirium; though at the beginning the pulse seemed to be full and throbbing, and the pain, cough, and oppression is very urgent, as to indicate bleeding pretty strongly. In these cases the blood was seldom buoyant to any considerable degree, but commonly very florid, of a very loose and soft consistence, or very dark-coloured, and coated with a thin and bluish or greenish film, under which was a soft greenish jelly, and a dark livid crust at the bottom. Sometimes the coat was much thicker and more tough, but of a pale red colour, resembling the cornelian stone, or a dilute jelly of red currants. When the blood is thus dissolved, abstain from farther bleeding, especially, if the pulse or patient becomes more languid after it, though the oppression, load, or even pain, may seem to require it.

When the fizy coat on the blood is excessively tough, and extremely yellow, or of a pale red colour, it threatens danger; for the inflammatory lensor will scarcely mix with any diluents. Sometimes, after repeated bleeding, the craffamentum has scarce been a sixth part of the volume of the blood, and yet as solid as a piece of flesh. This is generally mortal.

When the peripneumonic symptoms continue for four or five days or more, we may justly fear an abscess, or a mortification; and little advantage is to be expected from farther.
... farther bleeding. But if the pain returns with violence after having ceased a considerable time, it is a sign that a new inflammation is forming, which indicates bleeding as much as the primary, but not in the same degree.

The strength of the patient and pulse, the violence of the pain and difficulty of respiration, are, in a great measure, to determine the quantity. When the pulse and strength seem to require bleeding, cupping on the shoulders will relieve the breast and head. Likewise the use of blisters, infus, fefts, are very serviceable in inflammations of the lungs.

Laying a blister on the part affected is the proper cure of a pleurisy; but a peripneumony is naturally more dangerous; and the more so as the epipatitic cannot operate so directly on the lungs as the pleura. But even in this case, blistering is most to be relied on after bleeding. You may first blister the back, and afterwards one or both sides. Epipatitics tend to relieve the breast, not only when applied to the chest, but also to the extremities; and promote expectoration: Whereas bleeding must be used cautiously, if at all, after the spitting appears.

The fever and the inflammation require a cool, diluting regimen, and nitrous and relaxing medicines; together with a moderately cool, free air, and quiet both of body and mind. A close room is very incommodious; if it cannot be avoided, it should be prudently aired. There is nothing more proper than thin whey, a barley ptisan with liquorice, figs, &c. the infusion of pectoral herbs, such as ground-ivy, maiden-hair, colt's-foot, hyflop, &c. These should be gently acidulated with juice of Seville oranges or lemons. Honey will render them more serviceable in inflammations of the lungs.

When much sincere, florid, or frothy blood is spit up, take away as much blood immediately as the patient's strength will bear. If the haemoptoe continues, bleeding in the saphoena will be found of the utmost service. Then direct cooling emulsions, nitrous, demonic, and mucilaginous medicines; and vegetable and even mineral acids, if the spitting of blood is very considerable. The drink may be a decoction of red poppies, colt's-foot, and figs, acidulated with elixir of vitriol. The cough may be appeased with diacodium, or elixir paragaries. A valuable drink. Direct diacodium, or elixir paragaries, to moderate the cough, in small doses often repeated; psorura ceti, olibanum, myrrh, and camphor, tend to increafate the thin catarrhal humour, and abate the iritation.

In the Putrid Peripneumony the expectoration is livid, gleyey, and faniouf, frequently reftembling the lees of red wine; sometimes more black, and sometimes very fetid. This is often the cafe of the highly scorbutic; particularly sailors, after a long voyage. Blood taken from these, appears to be in a dissolving putrefcent state. The craffamentum is loofe and tender, the serum turbid and reddish; the tongue is black; the teeth furred with a dark, thick fordes; the breath offensive; the urine high-coloured or blackifh. Black spots, or a dysentery, frequently appear on the fifth, fifth, or seventh day. The pulse and strength sink after bleeding: sometimes a vast anxiety, fainting, a cold sweat, a thready intermitting pulse soon after. This has sometimes happened in pleuro-peripneumonies, where the pain of the side was violent, the load at the breast great, and the cough considerable.

This will never bear a second bleeding to advantage; seldom the first, unless there is a considerable degree of firmness and tension in the pulse. When there is reason to be diffident, order scarifications and cupping.

In this disease give a decoction of figs, colt's-foot, and red poppies, well acidulated first with juice of Seville oranges or lemons, and afterwards with gas sulphuris; or elixir vitriol. Sitre, olibanum, myrrh, flowers of sulphur and bole may be administered, with conserv. lujule, rob of elder, currants, mucilage of quince-feeds, and syrup. de rubeo ida: camphorated vinegar, with syrup of elder or raspberries, is an excellent medicine. A spoonful or two of these latter should be given ever and anon. Sound cyder, and wine and water with Seville orange or lemon juice, drank warm, promote expectoration when deficient. Tincture of roes with red poppy flowers, has moderated an inordinate defluxion of thin bloody ichor. However, oxymel of squills, and strong cinnamon-water, are frequently necessary to pump up the ichor, when a great rattling in the throat and difficulty of breathing indicate a vast quantity of it in the lungs. And yet the violence of the cough may be often appeased by elixir athmaticum or diacodium. The patient is to be supported with fago, panada, harthorn jelly, roasted apples, cream of barley, or thick gruel, with a little wine and juice of lemons, giving a little at a time, and often. Strawberries, raspberries, currants, cherries, may sometimes be indulged.

At the close, the whole depends on a well-regulated diet. A toft with diluted red port wine, mulled with Seville orange-peel, mace, or cinnamon, and well acidulated, may be very useful. Bliffers are seldom beneficial in this cafe, but often mischievous.

A very thin yellow spitting, either shows that nothing but the thinnest part of the blood is strained through the arteries of the lungs, or that the whole mass of blood begins to dissolve; that its bilious principles are highly excited, and that all tends to a general putrefaction. It is commonly
of the faculties of the mind, thick and short breathing, beginning with an oppression of the breath. The com-
motions it excites are so small, that the heat and fever 
are scarce sufficient to make the patient sensible of his 
danger. Afterward, slight shiverings which come on by 
fits, and the attacks of a gentle fever, appear; whence 
the difficulty of breathing and weakness suddenly increa-

When perpetual, laborious wheezing, great anxiety 
and constant oppression on the precordia, comatous symp-
toms, cold extremities, and dark bad-coloured nails 
and vifage come on, the patient is in immediate danger. 

When comatous symptoms and a very difficult breathing 
remain after bleeding, cup and scarify the neck 
and shoulders. This has frequently had a surprizing ef-
fect. When the cafe is very threatening, blister the sac-
ifications.

After bleeding, let the patient have the following clytter, 
which must be repeated daily till the lungs are relieved. 
Take 3 ounces of honey, the yolk of an egg, and 8 
ounces of barley-water. Make them into a clytter.

Let the patient’s diet be very slender, such as weak 
broths, sharpened a little with orange or lemon juice, 
and he may drink a weak mixture of honey and water; 
the fumes of warm water may be taken in at the mouth. 

Likewise let the legs and feet be bathed, and large 
blisters applied. Sydenham advises a repetition of the 
bleeding and purging alternately, every other day, or at 
greater intervals, as the strength and symptoms require. 
But he has generally found twice bleeding sufficient.

Of the Inflammation of the Liver.

When the liver is inflamed, it compresses the stomach, 
diaphragm, and the neighbouring viscera of the abdomen; 
it stops the circulation of the fluids, hinders the genera-
tion and excretion of the gall, and all digestion. It pro-
duces a great many bad symptoms, as the jundice, with 
all the diseases depending thereon; for the liver receives 
the refluent blood from almost all the parts of the ab-
domen, and is the chief instrument of almost all the di-

gestions that are made there.

A fever, an inflammation, and pungent pain on the 
region of the liver and diaphragm, a tension of the hy-
pochondria, yellowness of the skin and eyes, and a faffron-
coloured urine, are signs of an inflammatory disposition 
of the liver.

It begins with cold and shivering, sometimes with vo-
mitting and a fever, watching, difficult breathing, in-
quietude, and collynefs. This is a kind of rheumatic 
or erysipelas fever, proceeding from a sharp viscid 
serum, lancinating the nervous fibrille. It is sometimes 
accompanied with a bastard pleurisy, to which it is akin.

It is not very dangerous, and rarely kills, unless the 
viscera are unfound.

Narcotics and sudorifics are to be shunned.

This disease terminates as other inflammations, being 
cured by resolution, concoction, and excretion of the mor-
bid matter; or else in an abscess, seirrhous, or gangrene.

During the first stage, a warm regimen and saffron are 
improper.

Cooling resolving liquors, taken inwardly, as whey 

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with forrel boiled in it. Outward fomentations, and fre-
quent injections of cryflers, bathing, and friction, relax,
and render the matter fluid. Honey, with a little Rhenifh
wine, or vinegar; the juices and jellies of some ripe
garden fruits; and thofe of fome lacteal plants, as
endive, dandelion, and lettuce, are refolvent.

Fat oily epithems, and plaiters, are to be fhunned.
Camphor in croceated spirit of wine is only to be used in
the beginning, or when the fever is moderate, and na-
ture fluggilh. Bleeding at firft is neceffary on the affected
fide, in the hand or foot.

Violent purging hurts; gently relaxing the belly re-
lieves: diluents, with nitrous fahs, are beneficial, or
tamarinds boiled in warm water or whey.

A cryfler purely oleous is benefial, with a bladder-full
of an emollient decoction. Inwardly, diluting and refolvent
mixtures.

If it is attended with the judicious, then apply epithems
of carduus benediflus, fcorfium, wormwood, elder flow-
ers, chamomile, feeds of lovage and cummin boiled in wine,
and often applied.

Pringle fays, the beft remedy, after plentiful bleeding,
is to lay a large bliffer over the part affected.

Bloody flools, not in an extreme degree, or ftruck
with blood, ought not to be flopped, because they help to
refolve the diftemper: bleeding at the nofe often does
the fame.

The feveth matter is frequently carried off by urine;
and therefore diuretics not highly stimulating are proper.

Sweating ought not to be promoted by hot cordials,
but encouraged by warm diluting liquors.

The cafe is deplorable, when the inflammation termi-
nates in a fuppuration, unlefs the abfcefs points outward-
ly, fo as it may be opened. For if the pus is evacuated
into the abdomen, it produces putrefadion, or an incu-
vable hepatic dyfentery or bloody-flux.

Of a Paraphrenitis.

This difeafe is an inflammation of the diaphragm, and
parts adjacent. A paraphrenitis is attended with a very
acute continual fever, an intolerable inflammatory pain of
the part affected; which is extremely augmented by in-
spiration, coughing, fneezing, repletion of the flomach,
a naufea, vomiting, compreflion of the abdomen in going
or to ftool or making water. Hence, the breathing is thick,
short and fufficiently, and performed only by the motion
of the thorax. There is also a conftant delirium; a
drawing of the hypochondria inwards and upwards, an
involuntary laughter, convulfions, and madnefis.

This difeafe terminates as in a pleurisy; but is attended
with more violent fymptoms, and is much more fatal. If
the part affected fuppurates, the matter will fall into the
abdomen, and produce a purulent afcites.

The cure muft likewife be attempted in the fame manner
as in a pleurisy.

Of the Inflammation of the Inteftines.

This difeafe contrabies the intestines, and flops up the
passage through them. There is a vehement, fixed, burn-
ing pain, which is irritated by things taken inwardly.
When the inflammation is in the upper part of the inte-
ftines, the flomach will be greatly diffended by wind.
When the pain is exasperated, it produces convulfions of
the diaphragm and abdominal muscles, vomiting, painful
inflations, with rumblings, and sharp gripping pains which
may bring on the iliac paflion, or twifting of the guts.

When there is a burning pain in the abdomen, with a
preternatural heat of the whole body, as also a quick pulse,
lofs of strength, anxiety, and inquietude, the feat of the
difeafe may juftly be fuppofed to be in the intestines. If
the sharp pain is above the navel and below the flomach,
attended with a fever, naufea, and reaching, it is a fign
that that part of the colon is affected which lies beneath
the flomach, and is extended from the right to the left-
side. If the pain lies in the right hypochondrium, un-
der the fpurious ribs, it fheves that part of the colon to
be inflamed where it joins to the ilium. When the com-
plaint is of the left fide, under the loins, where the ploas
mucle is placed, it is a fign the colon and that part of
the mefentery joined thereto is the feat of the dif-
eafe, efpecially when it adheres to the peritonaeum. But
when the pain is in the middle of the abdomen about the
navel, it fheves the small-guts are certainly affected. In
all these cafes the pain is fuppofed to be attended with a
fever.

When there is a fever, and a burning pain in the low-
er part of the belly, attended with a swelling, which ends
in a copious, putrid, or purulent flux, with a great difor-
sation, the patient fhould only be nouriflied with
animals, applied to the body, are extremely beneficial,
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animals, applied to the body, are extremely beneficial,
After bleeding and clysters, if the pain still continues violent, there will be no manner of danger in giving opiates, by which means the excruciating pain will be alleviated, the fluxes appeased, and a breathing sweat will follow. When this is done, and the fever is abated, there will be no occasion to continue the diluting, relaxing, and moistening medicines, but rather the nervous and corroborating.

If the patient survives three days, and the acute pains of the pain abates, with a chill or shivering throughout the body, it is a sign of a suppuration; then within fourteen days the impothesis will break; and if it falls into the cavity of the abdomen, it will corrupt the whole mass of fluids, putrefy the viscera, and turn to an ascites.

In this case, whey and chalybeate waters are likely to prove most beneficial.

If the fever continues, with clammy sweats, paleness, an ichorous diarrhea, fetid, black, or like the washings of flesh, a small intermitting pulse, and at last a total cessation of pain; they are signs of a gangrene and an approaching death.

Of the Nephritis, or Inflammation of the Kidneys.

The symptoms of a nephritis are, a great inflammatory, pungent, burning pain, in the place where the kidneys are situated, attended with a fever; the urine is made heavy, but small in quantity, and very red or flame-colored, yet, in the highest degree of the disease, watery. There is a numbness of the thigh, and a pain in the groin and the testicle, of the same side; a pain in the ilium, bilious vomiting, and continual eruptions.

When the inflammation is deep, the fever violent, the burning pain in the loins lafting, the difficulty of making water great, the body very collyve, the anxiety and straitness of the praecordia exquisite, the urine crude and white; likewise, if the pain continues till the fourteenth day, the kidney will suppurate; which is known from the abating of the pain, and from the thick purulent sediment of the urine. This will sometimes last several years, till there is nothing left of the kidney but a bag: it is attended with a hectic fever, and the patient before he dies is almost reduced to a skeleton. If the bag happens to burst, it brings on a retention of urine, and intolerable pains, which end in death.

If it continues beyond the seventh day, an abscess is to be feared, which is known to be forming by a remission of the pain, succeeded by a pulsation in the part, and chills and shivering often returning.

When the disease is favourable, it is cured by resolution, of a copious, red, and thick urine discharged at one time, or by a large flux of blood from the hemorrhoidal veins, in the beginning of the disease.

It is cured by plentiful bleeding, revulsion and dilution; by soft, emollient, antiphlogistic decoctions.

When a burning and fixed pain in the loins continues for some time, it is a sign that the venal veins are stuffed and obstructed with a thick blood, which requires immediate bleeding in the foot; or if there is a disposition to a hemorrhoidal flux, apply leeches to the anus.

Afterwards give such things as temperate the heat of the blood, and promote a free circulation, with a diaphoretic. For which purpose, emulsions, demulcents, diluents, antispasmodics, diaphoretic powders, with cinnaubar and nitre, are preferable to every thing else.

Emollient clysters, without any saline or purging flux, are the principal help in this disease. They may be made of milk, whey, or soft water, in which elder and chamomile flowers have been boiled; to which add an ounce or two of syrup of marshmallows, and a dram of nitre.

When there are convulsions, or excessive pain, opiates are proper. If the vomiting, a symptom of this disease, is too frequent, warm water sweetened with honey is beneficial.

The patient should avoid all acrimonious aliment; he should neither lie too hot, nor on his back.

When an abscess is formed, the medicines must be powerfully maturing and emollient: When the urine appears purulent, they must be diuretics of medicated waters, whey, and the like; together with balfamics.

Emulsions are likewise useful of the four cold seeds and sweet almonds. Some attribute a great virtue to cherry-tree gum dissolved in whey or water, and taken often. Also syrup of marshmallows is very useful. Add to these, the decoction of veronica, sweetened with honey, and mixed with powder of nutmegs.

Butter-milk, not very four, has been reckoned a great secret in ulcers of the kidneys; and chalybeate waters have been beneficial to some. Spruce-beer is a good balsamic in this case.

Of the Inflammation of the Bladder.

The pathognomonic sort of this disease are, an acute, burning, piercing pain in the region of the pubes, attended with a fever, a continual tenesmus or desire of going to stool, and a perpetual striving to make water.

Other symptoms are, a rumbling of the bowels, gripping pains, great anxiety of the praecordia, difficult breathing, want of appetite, vomiting, coldness of the extremities, a hard, quick, unequal, contracted pulse, inquietude, and sometimes convulsions.

There is another kind which is more superficial, and is either rheumatic or erysipelas, in which the fever is more easily and speedily cured by promoting a diaphoretic:

And persins in years, or who are affected with the scurvy, gout, rheumatism, or violent head-aches, are most subject to it; especially if they catch cold by being exposed to the rigour of a cold north-wind.

The former arises most commonly from the floppage of the menes, bleeding piles, or other utal fanguinary evacuations; and not seldom from a violent gonorrhoea unskillfully suppressed by antirhagens, or when treated by medicines of too sharp and hot a nature.

This disease is mortal, if it terminates in an ulcer or mortification.

The cure must be attempted with bleeding in the feet, if a suppreffion of the menes or hemorrhoidal flux be the cause.

If it proceeds from the scurvy, &c. recourse must be had to gentle diaphoretics, diluents, and remedies which obstruct.
obtund the acrimony of the humours, such as decoctions of the roots of scorzonera, china, skirrets, and fennel; also infusions, in the manner of tea, of the tops of yarrow, flowers of mallow, winter-cherries, and seed of daucus, made with milk, and sweetened with frup de althea. If the patient’s body is collyve, manna will be proper, with nitrum flihiatun; to which rhubarb may be joined, as occasion requires.

Externally, antispafmodics and gentle diocutients will be proper: For this purpose apply bladders filled with a decoction of the emollent flowers.

If the tenseness and difficulty of urine arise from spafms, there is nothing better than the vapours of a decoction in milk of the flowers of melilot, elder, chamomile and mallow, and the tops of yarrow. This decoction may be put into a clofe-floid; and the patient fit over it.

Tulpius informs us, that a desperate ulcer of the bladder was cured by the constant use of spaw water.

Of the Ophthalmia, or Inflammation of the Eyes.

An inflammation of the membranes which invest the eye is a very common disease, especially of the adnata or albuginous coat of the eye.

The eyes are very much inflamed, with great pain, tension, tumour, heat, and redness; and sometimes there is such a strong sensation of pricking in the eye, as if it was caufed by a needle or thorn. The eyes at first are full of scalding tears; which are followed by a pituitous parts will fwell even as far as the cheeks, with a ftrong pulfation of the adjacent arteries. The fmail blood-veffels are vifible, which in health are not to be feen, and all the white of the eye becomes red.

If, besides these external signs, there is an appearance of moths, duft, flies, &c. floating in the air, there is an inflammation of the retina.

As in all difeafes of the eyes, fo especially in their inflammation, the patient must abstain from all spirituous liquors, the fmoak of tobacco and flernatatories; he must likewise avoid fmoaky rooms, and the vapours of onions and garlic, as also all vivid lights and glaring colours. The drink may be water alone, or a decoction of fennel-feeds, harthorn, and barley; the aliment must be light of digeftion.

Intemperance of all kinds renders persons liable to this disease; as alfo a keen north-wind, and looking earnestly at the fire, fun, or glaring colours; likewife fmoaky rooms, metallic vapours, coftivenefs, and unual refregrations of the extreme parts, especially in the time of menftruation. Sometimes it is owing to other difeafes, as external injuries; but not when they proceed from a ferontious or venereal caufe. In bad cafes, after the inflammation has yielded a little to evacuations, the coagulum aluminofum, fpread on lint, and applied at bed-time, is the beft external remedy.

In the mean while, blifters muft be applied to the neck, and kept running for fome days; and after that, fetsons, or iffues at leaft. It is hard to fay, of what vaft advan- tage blifters and fetsons are in this difeafe.

The expreffed juice of millepedes may alfo be given [25 are a dofe] on the days purging is omitted, in four ounces of beer, or Rhenifh or French white-wine: let them ftand, when mixt, all night; and then take it with a little fugar in the morning, after the mixture is drained.

But according to the later experience of Dr Fordyce, Fothergill, and others, a ftrumous ophthalmia may be cer- tainly and fafely cured by half a dram of the bark given twice a-day.

The length of time in which the bark is to be taken is uncertain; for in fome the cure is performed in lefs time than others.

Hoffman, besides blifters, fetsons, &c. recommends cupping, with fcarification, in the nape of the neck, and behind the ears; and in the violent fort of this difeafe, bleeding in the jugular; as alfo fnaipifms of rocket-feeds boiled in wine, and then put into small bags and applied to the nape of the neck or under the armpits. For in- ward ufe, he prefers to all other remedies, an infusion, in the manner of tea, of valerian-root, liquorice, elder-flowers and fennel-feeds, drank plentifully; and before the
The drinking of it to receive the vapour or steam into the eyes.

Of the Apoplexy.

This disease is a sudden abolition of all the senses, external and internal, and off all voluntary motion, commonly attended with a strong pulse, laborious breathing, a deep sleep, and snorting.

There is no difference between a person asleep and in an apoplexy, but that the one can be awakened, and the other cannot.

The causes of this disease are a particular conformation of the body, as a short neck, for some have fewer vertebrae in their necks than others; a groat, plethoric, fat, phlegmatic constitution; polyphous concretions in the carotid and vertebral arteries, or about the heart, or within the skull, which are known by an unequal pulse, a vertigo, and sometimes a momentary loss of sight; an inflammatory thickening of the blood, preceded by a fever attended by the head aching, redness of the face and eyes, an advanced age, attended with a glutinous, cold, catarrhal, leucophonegetic constitution.

The forerunners of an apoplexy in these last, are, dulness, inactivity, drowsiness, sleepiness, flux of speech and in giving answers, vertigoes, tormsigns, oppressions in sleep, night mares; weak, watery, and turgid eyes; pituitous vomiting, and laborious breathing on the leaf motion.

Other causes may be, whatever compresses the vessels of the brain; as, a plethora, a cachexy, attended with fulness of the vessels; a hot constitution; tumors within the skull; the velocity of the blood increased towards the head, and diminished downwards; compression of the veins without the skull, which bring the blood back from the brain; the effusion of any fluid compreings the dura and pia mater externally; the effusion of any fluid within the brain; which by its pressure hurts the origin of the nerves; this is the most common cause of apoplexies, and proceeds from blood in the plethoric, from a sharp serum in the hydroptic and leucophonegetic, and from an atrabilious acrimony in the melancholic, the scorbutic, the phlegmatic constitution; polypous concretions in the carotid and vertebral arteries, or about the heart, or within the skull, which are known by an unequal pulse, a vertigo, and sometimes a momentary loss of sight; an inflammatory thickening of the blood, preceded by a fever attended by the head aching, redness of the face and eyes, an advanced age, attended with a glutinous, cold, catarrhal, leucophonegetic constitution.

The immediate forerunners of an apoplexy, are tremblings, flagging, a giddiness in the head, a vertigo, dimness of sight, a stupor, sleepiness, forgetfulness, noise in the ears, more deep and laborious breathing, the night mare.

A slight apoplexy goes off in a profile, equal, resided, warm sweat; a large quantity of thick urine, by the bleeding piles, the flowing of the menses, a diarrhoea, or a fever. If it is more severe, it usually terminates in a paralytic disorder; and is seldom curable, but always leaves behind it a great defect of memory, judgment, and motion.

Bleed in the arm to 12 ounces, and then in the jugular to 7 ounces; immediately after which, give an ounce and a half, or two ounces, of emetic wine.

Apply a large strong blister to the neck, hold the patient upright in bed, and let the spirit of sal ammoniac, highly rectified, be held to his nose.

Let there be strong frictions of the head, feet, andhands; and let the patient be carried upright backwards and forwardsways the room, by two strong men. Strong blisters should be applied to the head, neck, back, and calves of the legs. Sharp clysters should be thrown up into the body, which have a tendency to excite the patient, and to cause a revulsion.

Shaw advises, during the fit, to bleed largely in the arm, or rather in the jugular, to apply strong volatiles to the nose, to blow sneezing powders up the nose, as also to rub the temples with spiritous cebaline mixtures.

Likewise to blow in the mouth and nostrils the smoke of tobacco from an inverted pipe.

Those who have once had a fit of the apoplexy, are very liable to be seized with it again; and if they are plethoric, the best preventative is bleeding once in three months, and using themselves to a spare diet; taking medicines which strengthen gently, and abstaining from cares and all intense applications of the mind; not neglecting infusions and infusions, nor the drinking suitable mineral waters.

Of the Palsy.

A Palsy is a lax immobility of any muscle, not to be overcome by the will of the patient. Sometimes the fentation of the part is absolutely abolished, and sometimes there remains a dull sense of feeling, with a kind of tingling therein.

It may be caused by all things that bring on an apoplexy; that render the nerves unfit to transmit the animal spirits; that hinder the entrance of the arterial blood into the muscles. Hence the nature of a paraplegia or hemiplegia, and the palsy of a particular part, may be understood.

Hence a palsy may proceed from an apoplexy, an epileptic, extreme and lasting pains, oppressions of the usual evacuations,
evacuations, translations of the morbific matter in acute
								
temperatures; whatever diffuses, diffuses, compresses, or
									contracts the nerves, strong ligatures, luxations, frac-
									tures, wounds, gangrenes, inflammatory and other tumors
									of the coats of the nerves, in the ganglia, or the nerves
									themselves; extreme heat, violent cold, mineral effluvia,
									and the too frequent use of hot water.

Pallies of the heart, lungs, and muscles serving for
									respiration, are soon fatal; of the stomach, bowels and
									bladder, from internal cauzes, very dangerous; of the
									face is bad, and easily changes to an apoplexy.

If the part is cold, insensible, and waifes away, it fel-
								
dom admits a cure; if attended with a violent convulsion
									and great heat of the opposite part, it is very bad.

The regimen in this discafe ought to be warm and at-
									temuating, consisting of spicy and cephalic vegetables, such
									as create a feverish heat, because it is necessary to dispel
									the viscofitv. Soapy vegetables are best, and such as consist
									of an acrid volatile salt, and oil, mustard, horfe radish,
									&c. stimulating by vomits; freezing; relaxing the belly;
									promoting sweat by such motions as can be used, or other
									means; by strong fridtion, &c.

The cure of the palfy is to be attempted by attenuants and
discutients; such as, aromatic, cephalic, nervous and
terine vegetables; the fixed and volatile salts; as also
by their oils; soaps made of their oils and salts; the stronc-
scnted parts of animals; the juices, spirits, oils, and
									liniments of infects; foflile salts, metallic crydials, and
									medicines compounded of these.

Likewise by things which stimulate strongly, and which,
									by exciting a tremulous and convulsive motion of the
								
ers, drive out the impacted matter; to this class, ftermu-
tatories and emetics chiefly belong, especially if often
									used at first.

By purging with warm, opening, aromatic vegetables,
									with acrid foflils, with mercurial and antimonal prepara-
tions, in a large dose, and repeated successively for fe-
								
tveral days, by the means of which a copious and lading
								
diarhoea may be excited.

By filling the vessels of the body with drinking a large
									quantity of the attenuants above mentioned, and then by
									exciting a greater motion and sweat by the vapours of spi-
								
ters set on fire.

Outwardly, fridtions may be used, either dry and hot,
till the part is red; or with spirits enued with a stimu-
lating virtue; or with nervous oils, liniments, balsams,
or ointments; vapour or immerfive baths; acrid, aroma-
tic, and drawing plaisters; cupping, fcarifications, blisters;
whipping the part with rods; exciting a flight inflamma-
tion with nettles, and the like.

A course of electricity for some weeks has been known
to have cured some invererate pallies, though it hath fail-
ed in others. See Electricity.

Of the Epilepsy, or Falling Sickness.

Sometimes this discafe comes on suddenly and una-
wares; but it oftener gives notice of its accession by some
preceding symptoms; the chief of which are, a laitude of
the whole body, a heavy pain of the head with some
disturbance of the senses, unquiet sleep, unusual dread,
dimmess of sight, a noise in the ears; in some there is a
violent palpitition of the heart, a puffing or inflammation
of the praecordia, a stopping of respiration, a murmuring
noise in the belly, fedit ftools, a flux of urine, a refrig-
eration of the joints; in others, there is a fene, as it
were, of a cold air ascending from the extreme parts to
the heart and brain.

Then they fall suddenly on the ground, (whence the
name of the falling sickness;) the thumbs are shut up close
in the palms of the hands, and are with difficulty taken
out; the eyes are distorted or inverted, so as nothing but
the whites appear; all fentation is suspended, infomuch
that by no smell, no noise, nor even by pinching the
body, can they be brought to themselves; they froth at
the mouth with a hissing kind of a noife, the tongue is la-
cerated by the teeth, and there is a shaking or trembling
of the joints.

However, the convulsions vary, as well as the defect
of the senses, both in degree and kind; for sometimes, in-
stead of convulsive motions, the limbs are all stif, and
the patient is as unmoveable as a statue. In infants
the penis is erected; in young men there is an emifion
of semen, and the urine very often streams out to a great
distance.

At length there is a remiflion of the symptoms, and the
patients come to themselves after a longer or shorter in-
terval; then they complain of a pain, torpor and heav-
iness of the head, and a laitude of all their joints.

These fits are more frequent or seldom, or longer or
shorter, according to their different causes. Some re-
turn on certain days or hours, or even months, according
to the quadratures of the moon, but especially about the
new or full moon; in women, chiefly about the time of
menstruation; and what is most remarkable, often upon
a very, flight occasion; for instance, any sudden perturba-
tion of the mind, as a fright, anger, sudden joy, intenf
application, ftrong liquors, excessive heat or cold, or ve-
nereal exercises.

As to the prognostics; in boys, this discafe terminates
about the seventh, the fourteenth, or the seventeenth year,
that is, about the time of puberty; in women, about the
fourteenth, viz. the time of menstruation. Likewise it has
been found by experience, that chronological epilepsies have
spontaneously ceased by the change of place, diet, and way of
life. Sometimes a quartan ague will put an end to an epilep-
sy and convulsion-fits. It is also remarkable, that the only,
or any other cutaneous disfemper, such as the small pox,
measles, military eruptions, &c. will either abate the viol-
ence, or quite stif the discafe.

The patient therefore need not defpair of a cure, if
the discafe is not of long standing, the fits short, the
disorder not hereditary, and the years advancing to the
time of puberty; or if it proceeds from a fault in the
prime vifor, from worms, from a bad regimen, or from a
subcutaneous discafe ill cured. Nor is there thefe deprete
if the epilepsy be flight, and when the fit is foreseen by a
feentation of cold air, arising from the extreme parts to
the back, praecordia, and head. and also when it is thuf-
pered in by anxiety, by want of strength, and a pro-
penity to vomit; or when the fenes are not quite abol-
ished in the time of the fit, or when it comes on in the
night, without the incurvation of the thumbs.
It is a bad sign if the epilepsy makes its first attack after the twenty first year, but much worse if the fits grow more frequent; for then the animal functions are often destroyed, and not only the memory, wit, and judgment are impaired, but the patient grows stupid and foolish. It sometimes ends in melancholy or madness. When it turns to a palsy or apoplexy, it is mortal.

The epilepsy is extremely difficult to be cured in adults, but in children it is the reverse. Blitters laid to the back part of the head are of great use a little before the paroxysm is expected: and the time may more certainly be foreknown, as this disease is influenced by the moon, and attends upon its phases, especially the new or full moon. The most proper medicines to correct the juices seem to be native cinnabar, and wild valerian root; a dram of which may be given morning and evening for three or four months, and afterwards two or three days before the new and full.

However, it must not be forgot, that this disease owes its origin to so many different causes, and is bred in so many different constitutions of the body, and the same remedy which succeeds in one case often fails in another; and therefore different medicines are to be tried, especially on adults. And great regard must be had to the times in which the paroxysms usually return, in order to effect a cure.

If the stools are full of blood, or it is carried with too great an impetuosity towards the head, then bleeding in the ankles will be proper, or leeches applied to the haemorrhoidal veins. This often happens to hypochondriacal or hysterical persons, to the melancholic, and women with child. Sometimes it will be proper to bleed in the jugulars; or to apply cupping-glasses with scarifications to the neck, and parts near the head.

It has its origin from a sharp, impure serum in the head, or in the membranes and vessels, as in cachectical or scabrous persons, or those who have been inconsiderately cured of edematous swellings of the feet, old ulcers, or blisters dried up; the driving in of the itch, scabs, or the ulcerating humour of a scald head; then the cure may be attempted by cathartics, by purifiers of the blood, by evacuating the impure humours with fomenta, infusions, cauterities, and blisters.

If it proceeds from violent pain, as for instance, from a fit of convulsion in the uterus, from the tooth-ache, ear-ache, or scab of the stomach and bowels; then clysters of oil of sweet almonds, or the like, are to be administered.

If, in children, it proceeds from gripes, or the breeding of teeth, nothing is better than to cleanse the prime vitre from filth, by milk-clysters, with a little venetian soap dissolved in them.

If from worms, after antiseptics and soft oily things, anthelmintics must be given, such as tansey, garlic, camphor, asea fettida, worm-feed, mercurius dulcis, and ethiops mineral, or powder of tin.

When the fits return at certain periods, or at the quadratures of the moon, a clyster or a vomit will be proper first of all, of half a dram of ipecuanha, in a decoction of raisins.

In the time of the fits, too free a use of volatiles, spirits, hot food, strong drinks, and strong stimulants, will add to the disorder. The fits are often occasioned by the surprising heat of the sun and moon; by strong sweet odours; by moving the body suddenly after being quiet a long time; by the discharging of vomit, and often by a kind of sleep, when the animal spirits are most active; or by being too much affected with cold.

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generally keep on their legs without falling; yet some
will grovel on the earth like epileptic persons, and will
weep, laugh, gnash their teeth, gape with their mouths,
put out their tongues, roll their eyes, and whirl their
heads about in a strange manner.

After the fit, some are inexpressibly weak; some faint
away, others fall into a deep sleep; in others, again, the
fit is terminated with eruptions, wind, vomiting, and
throwing out plenty of water. Very often a mucous di-
stin from the nose, or blood issues from thence, or from
the uterus or haemorrhoidal veins.

These persons have generally unquiet sleep, and full of
dread and terror, an uncertain appetite, their bodies ge-
erally a little collyve; they sweat with difficulty, but are
subject to great passions of the mind. The accesions of
the fits keep exact pace with the phases of the moon. In
women they precede or accompany the eruption of the
menstrual flow. They are most frequent and worst after meals;
and are easily excited by the passions of the mind.

The fits are generally preceded with a coldness of the
feet and limbs, or a kind of tingling sensation; which
also affects the os coccygis, and like cold air ascends up
the spinal marrow; there is a dilated flutulent pain in the
left hypochondrium, and such a constricting of the body
that neither wind nor excrements can make their exit,
nor will the anus admit a enema-pipe, or, if it does, the
enema and excrements are thrown up by vomit. The
bladder is likewise affected, that no urine can be made,
or at least but little, and thin and white. In others,
the accession begins with yawning, fretching, anxiety
about the heart; a hard unequally contracted pulse, the
heart-burn, nausea, vomiting, palpitations of the heart,
difficulty of swallowing, pain of the head and teeth, noise
in the ears, giddiness, &c. and then come on the con-
vulsions.

Though this is a terrible disease, it never kills suddenly.
When it is recent, the person young, and otherwise of a
good constitution, there is the greatest hopes of a speedy
cure. If usual evacuations of blood by the uterus or ha-
morrhoids are suppressed, the return will either mitigate
or cure the disease. On the contrary, if the humours are
thick and impure, the suppurition obliterates, their tempe-
rament inclining to great sensibility, the age advanced, or
the disease hereditary, or become habitual, the cure is
difficult. Sometimes, through ill management, it degen-
erates into an epilepsy or hypochondriac melancholy.

To cure the St. Vitus’s dance, take away about 8 ounces
of blood, more or less, according to the age of the patient;
the next day give half, or something more of the com-
mon purging potion according to the age, and in the
evening the following draught:

Take an ounce and a half of alexiterial water; 30 drops
of compound spirit of lavender; a cuple of theri
aca andromachi; and 8 drops of the tinctura theba-
ica. Mix and make them into a draught.

Let the cathartic potion be repeated thrice every other
day, and the same draught in the evening. After which,
bleed again, and repeat the cathartics three or four times;
and this course may be pursued to the third or fourth
time.

Apply to the soles of the feet emplastrum e carannis.

For fear of a relapse, at the same season of the next year,
or a little sooner, in which the disorder appeared, bleed-
ing should be again repeated, and purging two or three
times.

Allen cured two girls of this distemper with the expres-
sion of millipedes, and the Peruvian bark, after bleeding
and a gentle cathartic.

As to the cure of other convulsive disorders, if the pa-
tient be plethoric, or the pulse great, it must be begun
with bleeding either in the arm or foot; and if occasion
requires, it must be repeated two or three times, but not
till the fit is over. The air should be dry and serene, with
constant exercize; the aliment should be easy of digestion,
and all hot spirituous liquors should be avoided. The
constant drink should be the decoction of scorzonera roots,
with strong decoction of hartshorn, or wine, or the Selter’s
mineral waters. Pediluvia are likewise proper, of river-water,
wheat-bran, and chamomile-flowers. They should be used
pretty warm and deep, at the time of going to bed, and
afterwards sweating should be promoted.

The patient’s body, if collyve, must be kept open with
mannia, or with oily enemas; and if the fomes of the
disease is judged to be in the prime vie, it will be pro-
per, at the changes of the moon, to give a vomit with
mannia, that is, an ounce of manna with two or three
grains of tartar emetic.

If, about the time of puberty, this disease proceeds
from too early or excessive coition, or violent passions of
the mind, all things which cause a commotion in the fluids
must be avoided; such as, aromatics, sharp purges, eme-
tics, spirituous liquors, inordinate motions of the body
or mind, and all heating things in general. On the con-
trary, the diet should be soft, emollient, and nourishing;
such as cow’s or ass’s milk, or whey; as also baths of
sweat water mixed with milk. Likewise jellies, and de-
coctions of scorzonera, barley, hartshorn, ivory shavings,
and viper’s flesh, for ordinary drink, and chocolate.

If it proceeds from worms, the cure depends on their
being killed and expelled out of the body: But all an-
themintics, or worm medicines, are not to be made use
of in this case; such as garlick, vitriol, copper, aloes,
sharp purges, and mercurials; because, if they are given
inconsiderately, they are hurtful to the nerves. It will
be better to use enemas, made of milk, sweet things, and
oil; as also limings of a purging quality applied to the
navel and abdomen. Inwardly may be taken fomenta-
nici. If mercurius dulcis is given with a cathartic, it
will be necessary first of all to let the patient take a few
spoonfuls of oil of sweet almonds.

If it is caused by a suppurition of the meninges, emmen-
agogues and hot medicines are to be forbore; but bath-
waters and bleeding will be proper; as also pediluvia, if
made pretty warm; hot infusions of balm flowers, and
flowers of the lime-tree, tincture of caloar, absorbent
powders, antispasmodics, and anodynes.

If from a floppage of the haemorrhoidal flux, besides
bleeding and the above remedies, leeches applied to the
anus will be of very great advantage.

In the observations of the medcal society of London,
we have an account of a deplorable convulsive case being
cured by electricity.
Of the Convulsive Asthma.

An asthma is an impeded and very laborious respiration, attended with unpeakeable anxiety, and a straitness about the precordia, hindering the free circulation of the blood through the lungs, arising from variety of causes, and not without danger of suffocation.

There are several sorts of asthmata. One is, difficulty of breathing, proceeding from corpulency and a very full habit of body; and is most apparent after violent motion: but this is a slight disorder, and free from all danger. The next is the pituitous asthma, attended with a mod habit of body; and is most apparent after violent motion: this is a flight disorder, and free from all danger.

There is a heaviness of the breast, a slowness to perform customary labours, difficult breathing when going up a hill; the patients grow hoarse, cough, and are troubled with frequent cavitations; they cannot sleep, and are scarcely warm in their beds. As the disease grows worse, the cheeks look red, the eyes grow prominent as if they were strangled; they snore or wheeze while waking, but much more when asleep; they are fond of cold air, they keep themselves in an erect posture, and seem to suck in the air with open mouth: they are troubled with sweating about the neck and forehead; then comes on a violent cough, and the patient brings up a little cold froth; the urine is more plentiful, but without a sediment; the voice grows clearer, the deeps longer than are necessary, the breath is slow and gentle, but with a sort of a wheezing.

The longer this disease continues, the more sharp and violent all the symptoms become. The patient’s body grows more cold, and the urine is thin and watry; most commonly the feet swell, then the hands, face and back; there is a numbness of the arms, the countenance is wan and livid, or of a leaden colour. Then comes on a little fever, which grows worse in the evening; the whole body is cachetic, with an edematous swelling of the feet; there is a dropfy of the breast, or an ascites, or anasarca; at least there is a pulley on one side, or of the arm; or, instead, thereof a pulley of the eyelids.

When the disease is recent, and is owing only to the spasmodic contraction of the precordia, there are hopes of a cure; especially if the matter of the gout, ulcers, and exanthemata, are fent back to their proper seats. When the menses or hemorrhoids which were distended, it brings on a drop of the breast, obstructions of the lower belly, edematous swellings of the feet, a cachexy, and an universal droopy. In general, all convulsive asthmata portend a sudden exit, or suffocation, especially if there is a polypus of the heart; if it continues long, then the patient will die of the droopy; in which case it will be soon fatal; when there is a slow fever, an unequal intermitting pulse, a pulley of the arms, a continual palpitation of the heart, little urine, a syncope or swooning, then death is at hand. Some are carried off by an inflammation of the lungs, and the more grievous the disease the more languid the pulse. The asthma, in old persons, continues till death.

In the paroxysm, because the body is generally bound, and the wind and humours are carried upwards, the speediest assistance is from emollient and carminative calomel.

Afterwards use frictions of the feet, which have an incredible efficacy; also let them be put into warm water; for the feet are almost always cold. When there is a violent spasm about the precordia, hot fomentations are necessary, or bladders filled with hot milk, and applied to the part affected; likewise nervous liniments are very useful, rubbed in with a warm hand.

Internally, antispasmodics should be given, with gentle diaphoretics.

And this is all that needs to be administered in the fit.

Out of the fit, if it proceeds from too great a congestion of blood about the breast, or from a polypus of the heart, bleeding in the foot will be proper, as also leeches; in a suppreffion of the hemorrhoids, leeches should be applied to the anus; also gentle laxatives to cleanse the prime vies; likewise bodily motion, slender diet, and soft drink. If there are hypochondriacal or flatulent symptoms, then gentle laxatives will be the more necessary, together with calomel. When the menses or hemorrhoids are suppressed, nothing is better than the bath-waters, both for bathing and drinking; or the waters of Selters taken warm and mixed with milk.

When the asthma proceeds from the driving back some impure matter from the skin, or from the drying up of ulcers, and the humour is translated to the nervous parts of the breast, then gentle diaphoretics will be necessary to fend it back to the supercicies of the body.

After which the patient may drink tea made of balm, or elder, or lime tree-flowers, with the leaves of scorodima, or veronica and fennel seeds, or any thing else of the same kind. Remedies compounded of sulphur are likewise very efficacious in driving back the morbid matter to the skin, though outwardly they are hurtful in cutaneous diseases.

The returns of the fits are to be observed and guarded against, by moderate evacuations, as bleeding, gentle vomits, laxatives, and sometimes cathartics: but every thing that heats the blood should be carefully avoided, especially about the usual times of the paroxysms; because there is generally then a lurking fever, which ought not to be exasperated by heating food or medicines.

In a dry asthma proceeding from fumes of lead, an air replete with exhalations from quick-lime, or the vapours of piccoal; milk, cream, oil of sweet almonds, emulsions of
of sperma ceti, the fat of animals used internally and externally, answers every purpose. Country air, and following the plough, are beneficial to restore the debilitated tone of the lungs; and tea, made with hyssop, veronica, ground ivy, liquorice, and daily flowers, cannot be enough commended. But sweet things, in every kind of asthma, are harmful, especially in the humid or ferous, and the hypochondriacal.

Of a Cough.

The cough now under consideration is a primary diffuse, which greatly disorders the whole body by its vehemence and obstinacy. Its cause is, a flux of serous humours from the outward parts and extremities of the body to the lungs, and is seldom without feverish heats and shiverings towards the evening.

It is either moist or dry: the former afflicts the phlegmatic, whose fibres are lax and muscles soft, and who are more liable to it than men; as also infants, boys, and old men, more than those in the vigour of their age. The dry cough principally attacks the hypochondriac, the scombritic, the cachetic, and those who are lean and slender, and subject to convulsive disorders, and whose bodies like-wise abound with a sharp serum.

The most violent of these kinds of coughs is the tussis convulsiva, or ferina, whose effects are so violent as to put the patient in danger of suffocation: In children, this is called the hooping cough. Sometimes this is dry in the beginning; or the patient brings up a little thin serum, more or less sharp. Sometimes it is moist; and then after a very laborious fit, the patient expectorates a sublivid, and commonly a moist tough mucus. The extreme parts grow cold, the body is couvive, the urines and the vital fluids are driven in greater plenty and force towards the breasts and head; so that while the paroxysm lasts, the face is red and turgid with blood, the veins swell, the arteries beat quicker and stronger, the eyes are ready to start out of the head, the tears flow, the eyelids swell, and sometimes the blood, after sneezing, springs from the nose. Sometimes the very vesicles of the lungs burst, and a spitting of blood ensues. Sometimes a hiccup supervenes, and then at the same time the patient is affected with laborious vomiting; some discharge their excrements and urines incessantly; and the coughing of others is so violent as to cause ruptures, especially in children.

As to the prognostics, a dry cough often turns to a moist, by hurting the digestion, and rendering the patient cachetic. When a moist cough becomes suddenly dry, and the breast remains oppressed, we may conclude that a putrid or hectic fever, or an exalciation of the lungs, are near at hand. In the convulsive cough of children there is danger of a suffocation; which cough sometimes happens in difficult digestion, and in the measles. It sometimes causes gibbosity and ruptures in boys; in women abortion; in adults a spitting of blood and a phthisis. Coughs that proceed from a schirrus of the lungs or other viscera, are incurable; if from driving in of exanthemata, or breaking out of the skin, it grows easy as soon as they are thrown out again. All coughs attended with lots of sleep are bad; as also that which is frequent, tedious, obstinate, and proceeds from a defluxion on the lungs. On the contrary, a moderate heat in the night time, with an equal breathing sweat throughout the whole body, a larger flux of urines, and the body open at the same time, a more quiet sleep, and an easier expectoration, are certain signs that the disorder is going off.

If the cough is recent, and there is no fever, nor other signs of a balsam peripneumony; or if it is not the consequence of a pleurisy or peripneumony ill cured, by a neglect of sufficient bleeding; the patient need only abate from wine and flesh for some days, and use the following remedy.

1. Take 10 drops of balsam of sulphur, with a bit of candied sugar; to be used twice or thrice in the day.

Recent coughs, after bleeding, are softened by a mucilage of linseed, or by any common sweet oil: But the oils are made more efficacious by the addition of a volatile alkaline salt, in this manner:

2. Take an ounce and a half of oil of olives, 6 ounces of water, 60 drops of spirit of hartshorn, an ounce of peptoral syrup. Take three or four spoonfuls every fourth hour.

If the cough will not yield to these remedies, then it will be to no purpose to rely on peptorals, especially if there is a fever along with it, or if it proceeds from a pleurisy or peripneumony; for then it is to be cured by bleeding and purging, in the same manner as the balsam peripneumony.

When there is a thin, soft, sharp defluxion, jellies are proper, and a decoction made of barle, thavings of hartshorn, vipers-grass root, and liquorice; or the decoction of turpentine with sugar; and above all things, oil of sweet almonds fresh drawn.

When a tussis catarrhalis affects the whole habit or body, with a loss of appetite and a tabes, the cure must be at once. The patient should, as much as possible, breathe a temperate air, shunning all sauced and smoked dried meats, poignant
poignant fauces, for they render the blood and serum sharp and impure; he should also abstain from malt liquors, but more especially acid wines. The drink should be hydromel; or, if the patient is scorbatic, water alone, the cold being first taken off with toasted bread. The vulgar pour hot water upon wheat bran, and drink the infusion cold, not without success.

As to bleeding in this disease, it is necessary for those who are full of blood and whose veins are very prominent; or when the usual excretions of it are suppressed; it is also a good preservative, though the person has past his seventieth year. Blisters may likewise be used, in oblate cafes.

Of a Phthisis, or Consumption of the Lungs.

If an ulcer of the lungs consumes them so far that the whole habit of body waffles away, it is called a consumption of the lungs. This ulcer may proceed from any cause which may detain the blood in the lungs so as to change it into a purulent matter.

The causes may be referred.

I. To that temperament of the body which tends first to spitting of blood, then to an ulcer of the part where the blood has made its way through. This consuits.

In a tenderness of the arterial vessels, and in the impetus of a more or less acrimonious blood. This is known from a view of the tender and fine vessels, and of the tender make of the whole body, a long neck, a flat and narrow thorax, deprefed scapula; the blood of a bright red, thin, sharp, and hot; the skin transparent, very white and fair, with a blooming red in the cheeks; the wit quick, subtle, and early ripe with regard to the age, and a merry cheerfull disposition.

In such a debility of the viscera as disposes their too tenacious contents to produce obstructions, putrefactions, and to grow acrimonious, whereby the vessels are corroded, first causing spitting of blood, and then ulcers. This is discovered by a slight febricula, a little dry cough, an unusual heat, a redness of the lips and mouth, a flushing in the face; which are most apparent when the new chyle enters into the blood; a propensity to sweating when asleep, a weakness, a shortness of breath increasing upon the leaff motion.

In that age, when the vessels have attained their full growth, and will not admit of any further lengthening; when at the same time the blood increases in quantity, acrimony, and force; which happens between the sixteenth and thirty-sixth year of the patient's age.

In an hereditary disposition to this disease.

These dispositions to a phthisis are heightened,

By a suppression of accustiomary evacuations, especially the fanguineous; as the hemmorrhoids, menes, lochus, bleeding at the nose, usual blood-letting, chiefly in the plethoric, and those who have lost a limb.

By any violent shock of the lungs, by coughing, shorting, sighing, running, violent efforts of the body, anger, and wounds.

By sharp, saline, aromatic aliment, or drink; by the particular manner of living; by another disease, whence the quantity, acrimony, velocity, rarefaction and heat of

the blood are increased. Hence it frequently happens from acute fevers, the plague, small-pox, and scurvy. II. Likewise this collection of pus may proceed from a peripneumony, which terminates in an apoplexy.

III. When there is an empyema formed, it may corrode, destroy, and consume the lungs, and so produce the same disease as if they were waffed away by an ulcer generated in their own substance.

The sign of an approaching phthisis is a dry cough, which may continue for some months; whereas a simple catarrh is attended with spitting, and is but of short duration. Vomiting, or a disposition to vomit after eating, excited by the above mentioned cough, is a most certain sign of a phthisis.

It invades persons from eighteen to thirty-five years of age; the whole body waftes away. There is a hectic fever, which is most apparent after meals, and is known by the quickneis of the pulse, and the redness or flushing of the cheeks: The matter brought up by the cough is bloody or purulent; if it is spit into the fire, it yields an offensive smell; if into a vessel of water, it falls to the bottom. Though it is thick, it is not glutinous or tenacious, but fluid, and of different colours, viz. yellow, green, but mostly of an ash-colour.

This disease begins with a flight pain, moderate heat, and an uneasy or oppressive irritnnes of the breath. When blood is brought up by coughing, it is generally of a florid, scarlet colour, and frothy, and proceeds from the lungs with a remarkable noise. It is mixt with fibres, films, and small portions of arterial, venal, and bronchial vessels: The pulse is soft, small, and undulating; the breathing is difficult; and these symptoms are preceded by a saltish taste in the mouth.

Blood is coughed up from the lungs sometimes without any pain; and if there is a vessel broken, it most commonly flows out in a great quantity at the first eruption, and afterwards more sparingly.

Spitting of blood is cured by copious bleeding every third day, to the fourth time, or till the inflammatory pellicle entirely disappears. Sydenham advises the taking away 10 ounces of blood, to take the common purging potion the next morning, and at night an ounce of diascodium. Hoffman likewise advises gentle purging and pediluvia, as also putting the hands into warm water. For appeasing the anguish of the blood, he thinks nothing better than spirit of vitriol, but more especially the tincture of roes acidulated therewith. Morton very judiciously prefers the Peruvian bark. Refrigerating, thickening, styptic lenient remedies, used a considerable time, are serviceable, with which may now and then be mixed the most lenient balsamics.

Hoffman advises the following powder, as preferable to every thing else, in appeasing the spasmatic irritations of the lungs.

1. Take seeds of white henbane, and crabs-eyes, of each a dram; 12 grains of nitre; and one grain of camphor. Make them into a powder.

A prudent use of the nonnaturals is likewise necessary, that may bel oppofe the cause of the diseaf: and chiefly a proper aliment, and manner of living; a milk-diet is preferable to any other.
When the cure is performed, it will be necessary, by way of prevention, to bleed once in six months, for several years together.

But if, by reason of the violence of the disorder, or the unskilful use of phthisics, there should, after the spitting of blood, arise a difficulty of breathing, which continually increases, a wandering shivering heat and redness of the cheeks, a dry husky cough, a fit hectic fever, a preternatural thirst, a weakness, or sense of weight in the breast, it is a sight that the wound from whence the blood flowed has already begun to change to matter about its lips. Then under the crust of dried blood pus is formed; and this collection degenerates into a la

vicular and wandering shivering heat and redness of years together.

ulcer of the lungs.

of blood, arise a difficulty of breathing, which continually

into pus; a purulent consumption of the whole lungs, or

off by the constant concussions of the cough; a conversion

of one of its lobes; a continual dry cough, or spittle (hook

stained; a conversion of the blood-vessels and the bronchia

and quantity of the putrid pus, a dilatation and corro-

sion generally thefe which follow: An increase of the acrimony

ter Vomica; and that being broken, becomes an open

ulcer of the lungs.

The effects of an ulcer of the lungs thus formed, are

generally those which follow: An increase of the acrimony and quantity of the putrid pus, a dilatation and corro-
ding maceration of the membrane or bag in which it is con-

ained; a conversion of the blood-vessels and the bronchia

into pus; a purulent consumption of the whole lungs, or

of one of its lobes; a continual dry cough, or spittle (hook

stained; a conversion of the blood-vessels and the bronchia

into the tube of the larynx; the sometimes suffocating

discharge of the pus, or the daily coughing up of matter,

which sinks in water, and is thick, sweet, fat, fetid, white,

red, yellow, livid, ah-coloured, or trenched, and which,

put into the fire, has the smell of burnt flesh. Sometimes

the vomica breaks into the cavity of the thorax; from

whence proceeds difficulty of breathing, and the other

symptoms of an empyema. Then the respiration grows

exceeding bad; the chyle and the whole mass of blood

are converted into pus; the usual method of nourishment

is destroyed, the solids continually consume and waste

away; a hectic fever appears, with a small languid pulse,

and the heat in the upper parts intense, the cheeks look

red, and the face hippocratic. General there is an in-

expressible anxiety towards the evening; an unusual thirst;

profuse nocturnal sweats; red pulvules; a swelling of the

feet or hands on the side affected; excessive weakness; a

hoarse voice; a falling off of the hair; an itching throughout

the body, with watery pulvules; a debilitating diarrhoea,

with yellow, fetid, purulent, cadaverous stools; a suppression of the spitting; and then death.

Hence the following prognostics may be formed.

An hereditary phthisis is the most dangerous of all, and

is incurable unless the spitting of blood be prevented.

A phthisis from external violence, that is, proceeding

from spitting of blood caused thereby, is the fright-

est of all.

A phthisis in which the vomica breaks suddenly, and the

patient easily brings up a white, concocted, smooth

pus, and in quantity proportionable to the ulcer, with-

out thirst, and with a good appetite and digestion, due

secretions and excretions, is curable, though with diffi-

culty.

Heavy, solid, stinking, sweet spittle, with night-sweats,

livid cheeks, paleness of the face, the redness pinched up,

finking in the temples, incrustation of the nails, falling off

of the hair, and a colliquative diarrhoea, are signs of ap-

proaching death.

When a vomica is known to be formed in the lungs, then the physician must endeavour to ripen and break it; which is to be done by milk-diet, riding on horseback, warm vapoors and expectorants: Which done,

1. The blood must be guarded and defended against

the purulent infection, by remedies which are moderately

and agreeably acid and saltish, by vulnerary herbs, smooth

balfamics given in various forms, in great plenty, and

continued a long time.

2. The ulcer must be cleared as soon as possible from

the purulent matter, the lips of it cleaned and consoli-

dated, which is to be done by liquid medicines, by things

which promote coughing, by motion, riding, country-air;

these are expelients. The cleansers are detergent balfa-

mics, used inwardly and outwardly. The consolidators

are paregorics.

3. The aliment must be such as requires the least force

to make it pass freely through the lungs, and be there

affimilated, and at the same time be fit for nourishment.

Asks milk is very suitable to this intention, as also but-

termilk.

Small repeated bleedings are not only beneficial in old

coughs, threatening consumptions, but also after purulent

spitting and hectic symptoms have appeared. The quan-
ty of blood to be drawn is from four to seven or eight

ounces, once in eight or ten days.

Setsons, or issues made in the side of the part that is most

affected, are very beneficial.

We must endeavour to diminish the defluxion on the

lungs, by bleeding and gentle purging, as well as pec-

torals, accommodated to the various states of the dila-

mper, viz. by thickening medicines and attenuants, and

such as temperate the heptic fever, with emulsions

and ashs milk, &c. and lastly, by healing the ulcer with

balfamics, as opobalsamum; the dose is 20 drops upon

sugar; but this is not to be taken before due evacuations

have been first made.

After evacuations, great care must be taken that the

cough be appeased, lest the lungs should be weakened by

the continual agitation.

The most sovereign remedy to restore the lungs to their

pristine vigour is to get on horseback every day; and

he that will put himself upon this exercise for a cure, need not be tied down to any strict rules of diet,

nor be debarred from any sort of meat or drink, since the

whole fires of the matter depends wholly on the constant

and continual exercise of riding. Long sea-voyages have

of late been greatly recommended.

In the first stage of this disease, when the lungs,

trachea, and glands, throughout the whole pulmonary

tube, are stuffed with a piritous matter, separates from

the mass of blood, and the patient is afflicted with a con-

tinual cough, especially in the night-time, all proper

methods must be used to stop the influx of this catarrh, and to concoct the humours already impacted.

First, Blood must be taken from the arm, from six to

ten ounces: if the patient be plethoric, or accustomed to

bleeding; this is to be repeated once, twice, or thrice, at

proper intervals, especially if the flux of serum is like a

suffocating
The diet should be water gruel, ptisanos of boiled apples, pothead-drink, stoned raisins and liquorice, table-beer warmed with a toast, and the like. When the fever is on the decline, chicken broth, poached eggs, &c.

If there is occasion, the body must be loosened with baths of sugared milk, with chamomile flowers, and repeated as occasion requires; then take away ten ounces of blood on the face affected, which should be boldly repeated every, or every other day, according to the urgency of the symptoms.

In colliquative sweats, pearl juleps may be freely given, to which may be added chalk, corals, dragon's blood, or other absorbents. But the Peruvian bark for this purpose, is much better than any other medicine whatever. The patient should not be permitted to sleep too long, the bed-cloths should be light, and he should be removed to fine subtle air.

Of the Nervous Consumption.

A nervous atrophy or phthisis, is a wasting of the body, without any remarkable fever, cough, or difficulty of breathing; but is attended with want of appetite and a bad digestion; whence the whole body grows languid, and is continually falling away.

At first the body is edematosus, and as it was fluttered with a vivid chyle; the face looks pale and bloated, and the stomach lothes every thing but liquids. The patient is forced to keep his bed sooner than the progress of the decay of his flesh seems to require. The colour of the urine is uncertain, but it is generally very red and small in quantity; sometimes it is pale and copious.

No considerable fever is discernible—either by the pulse, heat, or thirst, though the urine is ever so red.

The causes of this disease are generally violent passions of the mind, a too free use of spirituous liquors, and unfavourable air.

Stomachic and nervous remedies are only to be depended upon; such as, chalybeates, antiscorbutics, cephalics, and bitters. If the body be colitive, two ounces of nitre, and a small quantity of tinctura sacra may be taken every fourth evening, and from 30 to 40 drops of elixir aloes, in a glass of white-wine with bitters, before dinner. The elixir of vitriol is excellent in this case, 20, 30, or 40 drops is a dose, in any convenient vehicle, once, twice, or thrice a day. Also about half an ounce of the chalybeate wine, in some proper liquid, in the winter; in the summer, the psw waters: the usual drink may likewise be made bitter with the vinum amarum; but nothing strengthens the stomach more than a decoction of wormwood.

Sometimes the patient may take eight or nine drops of opobalsamum, or spirit of hartnash, or of fal ammoniac, as friendly to the nerves; nor must he forget exercise and cheerful company, with other diversions.

Of an Empyema.

An Empyema is a collection of purulent matter in the cavity of the thorax, between the lungs and the pleura, which always supposes the breaking of a vomica into the said cavity.

Such are the vomicae or abscesses of the lungs, proceeding from inflammations, from spitting of blood, from...
a thick matter which cannot be expectorated. Of the pleura, from an inflammation, from a wound therein, healed outwardly but open inwardly; from a bruise, or a concealed rupture of it, turning to pus. Of the diaphragm, when, after an inflammation, it suppures, and breaks on its upper part. Also of the mediastinum and pericardium affected in the like manner.

An empyema may be foreseen from an inflammation of any of the above mentioned parts, which is not terminated and resolved by concoction, reversion, a crisis, or medicines; but is followed by shiverings, a febricula increasing at night, a wandering heat, a sense of heaviness in the part that was pained, a difficulty of breathing, a want of appetite, and an unusual thirst.

An actual empyema is known from twenty days being elapsed since the inflammation began, without expectoration of the matter; from the signs of a vomica in the above abovementioned parts disappearing; from a new pain, cough, difficulty of breathing, and spitting, arisings, and afterwards going off; from a dry cough, a weight on the diaphragm, not being able to lie but on one side, a noise made by the fluctuation of the pus, upon moving the body; from a low fever, a dullness in the cheeks, hollow eyes, heat in the emts of the fingers, crookedness of the nails, and a swelling of the abdomen.

The consequences of this disease are, a continual accumulation of pus from the ulcer not yet healed; the matter increasing in its acrimony, putrefaction, rank smell, and thinness, by being shut up in a hot, moist place; an impediment in raising the diaphragm and extending the lungs; a shortness and difficulty of breathing, and not easily performed unless in an erect posture, a dread of suffocation when laid down; an inability of lying, but on the affected side; a constant dry cough, with anxiety; a maceration and corroboration of the lungs, pleura, diaphragm, pericardium, and even of the heart itself, converting them gradually into filthy corruption; whence there are always livid, plumbeous, yellow, or violet-washed spots and areas; there is a kind of an itch and dry scabs.

The consequence of which is, a wasting of the whole body; a putrefaction of the fluids, which may be diffused through the corroded lungs, or carried downwards by a fatal copious diarrhoea; night-sweats, pus-flules in the face, crooked nails, a shiring yellowness of the skin, and a hippocrepian countenance.

The cure of this disease is different, according to its different cause and state.

When a vomica or abces is known to be formed in any of the parts before mentioned, all endeavours are to be used, that it may be speedily broken and determined to the outward parts, which must be attempted by actual or potential cauteries, or by incision and proper motion.

When the vomica is actually broke, then it is to be evacuated by the mouth, if nature seems to encourage it; or by urine, if there appear any signs in it of falling that way; or by an aperture of the thorax by a proper instrument. See Surgery.

In general, all inflammations of the lungs or pleura are followed by an adhesion of these parts, which allow nature to make a passage externally: And it is common in abcesse of the pleura and intercostal muscles to find them break outwardly; nor is it uncommon even in the lungs. Therefore, when there is an adhesion, no other operation is necessary than to open the tumour with a lancet, when the pus is formed; and if the suppuration is so plentiful as not to admit the healing of the outward ulcer, it may be kept open with a hollow tent.

Hoffman gives an instance of a person, who, after a peripneumony, fell into an empyema, and was cured by taking milk boiled with sugar of rose. The quantity was three pints a day. As also balsamic pills made of flowers of sulphur, oil of sweet almonds, spermaceti, Venice turpentine, saffron, and oil of aniseed. Likewise a powder made of crab's eyes, spermaceti, sugar, myrrh, liquorice powder, and balsam arnica.

Of the Sculvy.

This distemper chiefly afflicts the inhabitants of cold northern countries, and especially those who live in marshy, low, fat and moist soils, near stagnating water, whether fresh or salt. Those who live idle, sedentary lives are most subject, chiefly in the winter, to the attacks of this disease; as also those who feed upon salted and smoked fish or flesh, sea biscuit, thinking water, unfermented farinaceous vegetables, peas, beans, sharp salted old cheese; likewise those who are subject to melancholic, maniacal, hysterical, or hypochondriacal disorders.

It is known by spontaneous weariness, heaviness of the body, difficulty of breathing, especially after bodily motion; rottenness of the gums, a thickening breath, frequent bleeding of the nose, difficulty of walking; sometimes a swelling, sometimes a falling away of the legs, in which there are always livid, plumbeous, yellow, or violet-coloured spots; the colour of the face is generally of a pale tawny.

The first state of this disease begins with unusual laziness, intermitting weariness; the patient loves to be in a sitting or lying posture; there is a pain in all the muscles, as if he was over tired, especially of the legs and loins; when he wakes in the morning, all his joints and muscles seem to be tired and bruised.

In the second state, the gums swell, grow painful, hot and itching, and bleed upon the least pressure; the roots of the teeth become bare and loose; he feels pains in all the external and internal parts of the body, imitating distempers proper to the various parts.

In the third state, the gums at length grow putrid, with a cadaverous smell; when they are inflamed, blood drips from them, and a gangrene ensues; the loose teeth by degrees grow yellow, black, and rotten; the sublingual veins become varicose, and like rings; there are often fatal hemorrhages, which break out from the external skin, without any appearance of a wound from the lips, gums, mouth, nose, lungs, stomach, liver, spleen, pancreas, intestines, womb, kidneys, &c. Obiinate ulcers arise, of the very worst kind, which no applications will cure, and which are apt to turn to a gangrene; they break out in all parts, but especially the legs, and are attended with a stench. There is a kind of an itch and dry scabs, with
with a dry and mild leprosy. The blood drawn from a vein is black, grumous, thick, and yet wants its due consistence in the fibrous part; the serum is salt, sharp, and abounding with a yellowish green mucus on its surface. There are gawing, rending pains, quickly shifting from place to place, which grow more violent in the night, affecting all the joints, bones, and viscera.

In the fourth state, there are fevers of various kinds, which bring on an atrophy; sometimes diarrhoas, dysenteries, or violent stranguries; as also faintings and mortal anxieties, a dropfly, consumption, convulsions, trembling, a palsy, contusions, black spots, voiding of blood upwards and downwards, a putrefaction and consumption of the liver, spleen, pancreas, mefentery. Now the contagion spreads very quick.

The first sign of the approach of this disease is commonly a change of colour in the face, which becomes pale or yellowish, and bloated, with a little redness, and an aversion to exercise. The caruncles of the eyes appear of a greenish cast, and yet in other respects the patient feems in perfect health. However, the change of colour in the face does not always precede the other symptoms, though it constantly attends them. Then an universal latitude supervenes, and a stiftness and feelableness of the knees, with a difficulty of breathing on the least motion. Soon after this there is an itching of the gums, which swell, and are apt to bleed on the least friction. Then they become livid, soft and spongy, and afterwards extremely purid and fungous. This rottenness of the gums is an insupportable sign of this disease. These are not only subject to bleed, but there are hemorrhages from different parts of the body.

The skin is dry throughout the whole course of this disease, except towards the last, and in many it is rough. It often it appears like the skin of a goose; but it is most frequently smooth and thinning. It is stained with blue, purple, livid, or black spots; some of which are small, and others of a hand's breadth, when the disease is advanced. They are chiefly on the legs and thighs, but sometimes on the arms and trunk of the body. Some have a swelling of the ankles in the evening, which disapppears in the morning. In a little while it advances gradually up the leg, and the whole member becomes edematous. Effuptions, bruises, wounds healed up, and fractured parts, always become fortuitous first. Old ulcers will emit a thin fetid mucus, mixed with blood, and at length coagulated gore will lie on the surface of the fore like a cake. As the disease increases, they shoot out a soft, bloody fungus resembling bullock's liver, which sometimes will rise to a monstrous size in a night's time. The slightest bruises and wounds of scarlet pus defen- dere into such ulcers, and are easily distinguished from all others, by being putrid, bloody, and fungous.

To prevent the scurvy at land, it will be proper to chuse a warm, dry, pure air, with a diet of easy digestion, consisting chiefly of a due mixture of animal and vegetable substances: for those are most liable to it who live in marly, wet soils, and in places subject to great rains and fogs: or in damp, low apartments, unless they keep continual fires, and their chief food be flesh broths, with plenty of fresh greens or vegetables, and well-baked bread made of wheat-flour; as also a cheerful glass of some good wholesome fermented liquor. Cleanliness, entertaining amusements, and moderate exercise, will also be good preservatives in these cases. In garrisons, the soldiers should be kept as dry, clean, and warm as possible, and their provisions should be as wholesome as can be procured, with plenty of good vegetables, particularly fallads of garden-crefles.

The best method of preventing the scurvy at sea will appear from the effects which Dr. Lind has observed several medicines have had, especially those which have been greatly recommended as preservatives. On the 20th of May 1747, being on board the Salisbury at sea, he took twelve scrobal patients under his care. They had putrid gums, spots, and latitude, with weaknesses of their knees. They had a proper apartment in the fore-hold; their diet was water-gruel sweetened, in a morning; sometimes mutton broth for dinner, sometimes light puddings, boiled biscuit with sugar, &c. and for supper, barley and raisins, rice and currants, fago and wine, and the like. Two of these were ordered each a quart of cider in a day; two others twenty-five drops of elixir vitriol, three times a-day, upon an empty stomach, using a gargle acidulated with the same. Two others took two spoonfuls of vinegar three times a-day; having their gruels, other food, and gargles, well acidulated with it. Two of the worst patients, with the tendons of the ham rigid, were put under a course of sea-water, and drank about a pint every day, more or less, according to its operation, which was intended to be as gentle physic. Two others had each two oranges and one lemon given them every day, which they eat with greediness upon an empty stomach, at different times. This course was continued but six days, because no more fruit could be allowed. The two remaining patients took the bigness of a nutmeg, three times a day, of an electuary made of garlic, mulberr seed, balsam of Peru, and gum myrrh; using for common drink barley-water well acidulated with tamarinds; by a decoction of which, and cream, they were gently purged three or four times during the course.

The oranges and lemons had the best effect; for one of those who had taken them, was at the end of six days fit for duty; and he took nothing more but a gargle of the elixir of vitriol for his gums, which were not quite found, and so recovered his health entirely. The other being more recovered than any of the other patients, was appointed to look after them. Next to the oranges the cyder had the best effects, though it was not very good, being prick'd; for those who drank it were in a fairer way of recovery at the end of the fortnight, the time allowed for making the experiments, than any of the rest. Elixir of vitriol did no good unless as a gargle, nor yet any of the rest of the medicines. Oranges are preferable to lemons; for by these the lord Anson's people were so speedily and surprizingly recovered at the island of Tinian. Besides, Mr. Murray affirms, from experience, that oranges and lemons, when properly and sufficiently used, are an infallible cure in every stage and species of this disease, if there is any degree of natural strength left, and where a diarrhœa, lency, or dysentery, are not joined to
the other symptoms. He observes farther, that at the island of St. Thomas, fifty men belonging to the Canterbury, and seven to the Norwich, who were in all the different stages of this distemper, were cured in little more than twelve days.

But as oranges and lemons are apt to spoil, let the juice of these fruits be well cleared from the pulp, and depurated by standing some time; after which it may be poured off from the gross sediment. Let it then be poured into any clean open vessel of china or stone ware, which should be wider at the top than at the bottom, that it may evaporate more readily. But a china basin or punch-bowl is most proper, on account of the form. Put this into a pan of water over a clear fire; let the water come almost to boil, and continue nearly in that state, with the bowl full of juice in the middle of it, till the juice is found of the consistence of a thick syrup when cold. The slower the evaporation of the juice is, the better; that is, it ought to continue twelve or fourteen hours over the fire: When it is cold, it is to be corked up in a bottle for use. Two dozen of good oranges weighing five pounds four ounces, will yield one pound nine ounces and a half of depurated juice; and when evaporated, there will remain five ounces of extract, which in bulk will be equal to less than three ounces of water. So that twelve dozen of oranges may be put in a quart bottle, and preferred several years. The same may be said of lemons. When this is mixed with water and made into punch, few are able to distinguish it from the fresh juice mixed up in the same manner. However, when the fresh fruit can be had, the fragrancy of the peel may contribute somewhat to the cure of the scurvy; and when these are wanting, the same thing may be obtained from a few drops of their essence, or the aromatic oil contained in their rinds; and if a small quantity of this be added to the extract, it will give it the smell and fragrancy of the fresh fruit in great perfection. Or rather add a little of the outer peel to the extract a little before it is taken off the fire, and then the nicest taffe will not be able to distinguish the difference between the fresh fruit and this. The virtues of this extract, thus made, lie in so small a compass, that a bottle will serve one man at sea several years; for in the making of it there is little or nothing flies off besides the water.

It will likewise be of great use to feamen to have gooseberries, and the like, preferred in bottles in the same manner as the pastry-cooks; as also small onions pickled in vinegar, cabbage, french beans, &c. may be preferred, by putting them in clean dry stone-jars, with a layer of salt at the bottom, then a thin layer of the vegetable covered with salt, and so alternately till the jar is full. Then the whole may be peered down with a weight, and its mouth quite stopped that no air or moisture may enter. Thus the vegetable may be kept fresh and green for a whole year. At the time of using, the salt is to be washed off with warm water. This is the manner by which they prefer to never-failing remedy, Greenland scurvy-grass. Every common sailor ought to lay in a flock of onions, for they are a great preservative at sea. The Dutch sailors are preferred from the scurvy by pickled cabbage. Portable soup may be carried to all places. When the scurvy begins to make its appearance, sailors should be abridged in the same degree of their allowance of beef and pork, and eat them with mustard and vinegar; but the peas ought always to be served out in full allowance. It must be observed likewise, that a pound of boiled cabbage and onions will cure an adventitious scurvy in its first stage, either at land or sea, in any part of the world.

Besides fresh and preferred fruits and vegetables, fermented liquors of all sorts are good, but more particularly cider. Among these are included many wines of every kind; or the juices of fruits may be fermented with ale. Poor people that winter in Greenland under vast disadventages in point of air and diet, preserve themselves from the scurvy by spruce-beer, which is their common drink. Likewise the simple decoction of fir-tops has done wonders. The shrub black spruce of America makes this most wholesome drink just mentioned, and affords a balsam superior to molasses, &c. It is of the fir kind. A simple decoction of the tops, cones, leaves, or even of the green bark or wood of these, is an excellent astringiotic; but perhaps it is much more so when fermented, as in making spruce-beer. This is done by molasses, which, by its diaphoretic quality makes it a more suitable medicine. By carrying a few bags of spruce for tea, this wholesome drink may be made at any time. But when spruce cannot be had, the common fir-tops used for fuel in the ship should be first boiled in water, and then the decoction should be fermented with molasses; to which may be added a small quantity of wormwood and root of horse-radish. The freasher it is drank, the better. When other things are wanting, tar-water may be fermented in the same manner.

Those who have been weakened by long fits of illness should have the scurvy prevented by panada of bread newly baked, with a few drops of the extract of lemons, and a spoonful of wine; as also oatmeal and rice, gruels, plum-mercy, flewed barley, with raisins or currants, sago, and wine, &c. But more particularly pickled cabbage, and small onions boiled with the portable soup made weak. Most of their food ought to be acidulated with orange or lemon juice; and then as their strength increases, they should be indulged with more solid food. But before this, they should have a small quantity at a time and often, and they should be brought back to their labour by little and little. Exerce the on a deal-board, with the ends laid on two chests, will be very proper; because it promotes the circulation, and strengthens the fibres, without any lobs of spirits.

Bad air of any kind has a bad effect upon a ship's crew; to remedy which, a red-hot loggerhead should be put into a bucket of tar, and moved about, so that all the ship once or twice a day should be filled with this wholesome antifeptic vapour. In a moist air, whatever promotes perspiration is proper; such as dry linen, cleanliness, using the flesh-brush, garlic of raw onions before going into the rain, and keeping the bedding dry. Plenty of mustard and onions should be used with their viands.

The sure of this disease has been in a great measure anticipated by the means of prevention, much that little remains to be said about it. The diet should be light
light and easy of digestion, such as broths or soups made of fresh meat, with plenty of vegetables, such as cabbage, coleworts, leeks, onions, &c. The bread should be fresh and well baked; and fallals of all kinds are beneficial, but more particularly dandelion, forrecl, endive, lettuce, fumitory, and pariflane; to which may be added, seurvy-grafs, creftes, or the like, to correct the cooling qualities of the former. Summer fruits are all good, as lemons, oranges, apples, &c. The drink may be good found beer, cyder, or Rheinifh wine. Phyfic is never ne-

Milk of all sorts, if it agrees with the constitution, will be very beneficial, as well as whey, which is prefer-

sal polychref is use as a mild purgative and ex-

When the gums begin to itch and are fpungy, ufe a

garlic of the bark infused in brandy. When the putre-
faction increases, ufe barley-water and honey of rofes,

the gums muft be checked with a touch of spirit of falt, or oil of vitriol diluted. When the legs are fwellled, or
edematous, gentle friction is to be ufed at firft with warm flannel, or with woolen cloths charged with the fumes of benjamin and amber, provided the fwellling be small, soft, and not very painful, rolling them up afterwards with an eazy bandage from below upwards : But if they are much fwellled, stiff, and painful, they muft be fomented with a diftemperent fomentation, or rather the fteam of the fomentation fhould be received through a blanket rolled round the limb. This operation, repeated night and morning, will render the contracted joints fupple. After this has been continued for half an hour, the parts are to be anointed with palm oil. If a vegetable diet does not reduce the limb, sweat it with burning spirits, or bags of warm falt.

Ulcers of the legs muft be treated with very gentle compreffion, to keep the fungus under; and the fame ap-
plications muft be ufed as to the rotten gums. Mr. Murray has found a strong tincture of the bark of great ser-
vie in fcorbutic ulcers. In dangerous hemmorhages the

A fcorbutic diarrhoea fhould not be suddenly ftopt at

A fcorbutic diarrhoea fhould not be suddenly ftopt at

Physicians refer the different fymptoms of this difeafe to difterent farts; but their different and far-fetched cor-
rections of these farts are plainly ridiculous. Water is the

As to evacuations, bleeding fhould be ufed with the greateft caution; and none but the gentleft purges fhould be
given, fuch as fenfa, rhubarb, or manna. The diar-

When there is an exceflive impurity of the

When the gums begin to itch and are fpungy, ufe a

garlic of the bark infused in brandy. When the putre-
faction increases, ufe barley-water and honey of rofes,

In the hot or alkaline fcurvy, fcurvy-grafs is too warm to be administered alone, and fhould be corrected with

When the feurvy proceeds from muriatic farts, which

When the feurvy proceeds from muriatic farts, which

When the seurvy proceeds from muriatic farts, which

When the scurvy proceeds from muriatic farts, which

When the scurvy proceeds from muriatic farts, which
Of the Dropsy.

Dropsies are of various kinds; but those usually treated of by authors are the anasarca, afcites, and tympany.

When the lymph stagnates throughout the whole habit of the subcutaneous fat, or is shed therein, it produces an anasarca, which extends itself also to the abdomen and scrotum.

When the water is collected in the duplicature of the peritoneum, in the cavity of the abdomen, between the peritoneum and the vifcera of the abdomen, or in the diluted cavities of the glands and vesefls contained in the abdomen, it is called an afcites. If the dropy is owing to the rarefaction of some steam or vapour, arising from water, pus, ichor, or air, pent up and heated till they putrefy, then it is a tympany.

The caufe of these diseases may be, a family disposition thereto; a halfy drinking too great a quantity of cold water, and its not being evacuated upwards or downwards, or by sweat, or urine excited by heat or motion; acute diseases, especially the moist ardent, attended with unquenchable thirst, or otherwife; a lienterious dysentery of a long continuance; all obfinate obstructions of the vifcera; and a chbirus of the liver, spleen, pancreas, mefenteriy, kidneys, womb, or intestines; the jaundice; a violent quartan ague of long duration; the meloey; a diarrhoea; a long dysentery; the colic pain, an empyema; a consumption; the gout; too great evacuations, chiefly the blood; the drinking of harp, fermented, and spirituous liquors; the feeding on tenacious and hard aliment; very large and numerous hydridates hanging in the cavity of the abdomen; melancholy; the curvy, and the like.

The firft sign of the approach of this disease is the swelling of the feet and ankles, which in the evening will pit, if pressed with the fingers; which swelling disappears in the morning, effpecially if there begins to be a difficulty of breathing. And yet it must be remembered, that preg- nant women, or whose menfes are dopped, as alfo when breathing. And yet it must be remembered, that preg- nant women, or whose menfes are dopped, as alfo when breathing.

The firft thing to be done is to evacuate the ferous humours by cathartics.

Mayrne affirms, that mercurius dulcis, without doing any mischief to the body, acts directly upon the morbific caufe, and if poifible destroys it. If a faiivation follows, it is not dangerous, but may be prevented if the mercu- rial be joined to an active cathartic.

Many praffle the juice of the root of iris palustris lutea; and we have an instance of its efficacy in a molt deplorable dropy, in the Med. effays; eighty drops of which were given every hour in a little fyrup of buckthorn, which brought away many quarts of water by the firft night; the quantity was daily increafed till it came to two drams, and at laft was mixt with a fourth part of the fyrup, and given by spoonfils.

Sometimes purgatives are to be entirely omitted, when the patient is of a weak constitution, or women subject to vapours; and then diuretics only should be made ufe of; among which, thofe are molt powerful which conftit of lixivial fials.

Boerhaave likewife proposes to attenuate the humours by fmall dofes of mercurial prepara- tions, to be taken e- very other morning, in a little pulp of a roated apple; as half a grain of turbit hair; ten grains of white ginger; or one grain of red precipitate, with fix grains of nutmeg; or four grains of calomeing, with eight of winter’s bark.

Some have been cured by a pertinacious abjufnence from all liquids, living upon sea bifcuit with a little salt, and a very little rich wine. Externally, frictions of the parts have been found beneficial.

a gangrene, which may be prevented by lime water, exalted with camphorated spirit of wine and sal am- moniac.

But fomentations and cataplafs of the common hem- lock, frequently repeated and duly continued, are found more effectual than all other remedies.

The curatif indications in an anasarca, as well as in an afcites, are to reftrice the humours to their natural fluidity; to invigorate the languid circulation; to brace up and strengthens the relaxed solids; to promote the fecretions; and to carry off the redundant flaginating juices.

Strong draffic purges, steel medicines, abforbents, de- tergents and ftiematics, are belit fuinted to anfwer these in- tentions.

As for the antimonial wine, an ounce and a half, or two ounces, as the patient’s strength will admit, given in the morning, will in due time free the abdomen from the load of water. If it does not purge downwards as well as upwards, mix it with fyrup of buckthorn after the third or fourth dofe.

Some greatly recommend Bonitus’s pills for the drop- hy, the dofe of which is from half a scruple to a scruple; but Heister prefcribes them from half a dram to a dram.

Of the above-mentioned symptoms, there is a heaviness, a torpor, a coffe body, and at length a flow fever; the patient never sweats. In proces of time, the flaginating waters, being pent up in a hot place, become acrimonious; hence ulcers, gangrenes, bleeding at the nofe, a protuberance of the navel, a mortification of the vifcera, and death.

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Mayrne affirms, that mercurius dulcis, without doing any mischief to the body, acts directly upon the morbific caufe, and if poifible destroys it. If a faiivation follows, it is not dangerous, but may be prevented if the mercu- rial be joined to an active cathartic.

Many praffle the juice of the root of iris palustris lutea; and we have an instance of its efficacy in a molt deplorable dropy, in the Med. effays; eighty drops of which were given every hour in a little fyrup of buckthorn, which brought away many quarts of water by the firft night; the quantity was daily increafed till it came to two drams, and at laft was mixt with a fourth part of the fyrup, and given by spoonfils.

Sometimes purgatives are to be entirely omitted, when the patient is of a weak constitution, or women subject to vapours; and then diuretics only should be made ufe of; among which, thofe are molt powerful which conftit of lixivial fials.

Boerhaave likewife proposes to attenuate the humours by fmall dofes of mercurial prepara- tions, to be taken e- very other morning, in a little pulp of a roated apple; as half a grain of turbit hair; ten grains of white ginger; or one grain of red precipitate, with fix grains of nutmeg; or four grains of calomeing, with eight of winter’s bark.

Some have been cured by a pertinacious abjufnence from all liquids, living upon sea bifcuit with a little salt, and a very little rich wine. Externally, frictions of the parts have been found beneficial.
Of the Hydrocele, or Dropsy of the Scrotum.

The hydrocele, called the dropsy of the scrotum, hernia aquosa, and the dropsy of the testicle, is an aqueous tumour of the scrotum. Though authors mention several kinds, there are but two. The first is, when the water is contained in the tunica vaginalis; the second, when it is contained in the cellular membrane of the scrotum. This last is almost always complicated with an anasarca, a kind of dropsy which consists in the extravasation of the water which lodges in the cells of the membrana adipofa. The hydrocele in this case is known without any difficulty; for the skin is thinning and soft, yielding easily to a slight impression, which will remain pitted for some time; the penis is also sometimes prodigiously swelled by the liquor which infinuates into the cellular membrane. There are none of these symptoms in the dropsy of the tunica vaginalis.

In the dropsy of the cellular membrane of the scrotum, some recommend the puncture with a trochoth; others, to make small apertures here and there with the point of a lancet; others, to put a small slice of silk through the skin with a needle, and to let it remain as a feton, till all the water is drained off. But the two first methods yield very little relief, and the last may be more likely to induce a gangrene. Nor is there occasion for any operation at all, because the cellular membrane of the scrotum is nothing but a continuation of the membrana adipofa; and therefore scarifications made in the skin of the small of the legs will effectually empty the scrotum.

Yet sometimes there falls so great a quantity of water into the scrotum that the dilatation is very painful, threatening a mortification. Likewise the prepuce very often is so exquisitely dilated and twisted, that it hinders the patient from making water.

In these cases there should be an incision made on each side the scrotum, three inches in length, quite through the skin, into the cells which contain the water; and likewise two or three, half an inch long, in any part of the penis, with a lancet or knife.

The dropsy of the tunica vaginalis is caused by an excessive accumulation of a serosity, which is naturally separated in the internal surface of that tunic in a small quantity, to moisten and lubricate the testicle. Authors have hitherto distinguished them into two forts: the one on the inside of the tunica vaginalis and the other on the outside, between that and the scrotum, which they suppose to proceed from water in the dropsy afcites. But anatomy shows the absurdity of this opinion. For besides that persons afflicted with this kind of hydrocele have seldom any other dropsy, and those who have the afcites are free from this hydrocele; the tunica vaginalis is like a purer quite shut up on the outside of the abdomen, so that the water cannot infinuate into it from any part.

As to the notion that the water falls from the abdomen into the interface between the tunica vaginalis and the scrotum, it is equally impossible. For though in the intestinal rupture the gut falls into this place, yet it brings the peritoneum along with it, and that will prevent the egress of the water. This is a circumstance the ancients were unacquainted with, and the moderns have not sufficiently attended to.

This disorder is seldom attended with pain in the beginning, contrary to what happens in the hernia of the epiplon, and of the intestine; nor is it often the effect of any accident. It never diminishes when once begun, but generally continues to increase; but in some persons not so quick as in others. In one person it will grow to a very painful dilatation in a few months; in another it shall not be troublesome in many years; nay, it shall cease to swell at a certain period, and afterwards continue in that state without any notable disadvantage. But this is rare.

In proportion as it enlarges, it becomes more tense, and then is said to be transparent; but this is not always the case; for sometimes the scrotum is very much thickened, and the water itself opaque; so that to judge positively if there be a fluid, we must be guided by feeling a fluctuation; and though sometimes it is not very evident, yet we may be sure there is a fluid of some kind, if we are certain that the dilatation of the tunica vaginalis makes the tumour.

When a gut, or the omentum, form the swelling, it is soft and pliable, unless inflamed, and uneven in the surface, and reaches from the scrotum into the very abdomen; whereas the hydrocele is tense and smooth, and ceases before, or when it arrives at the rings of the abdominal muscles.

When the testicle is increased in size, the tumour is rounder, and, if not attended with an enlargement of the spermatic vessels, the cord may be easily distinguished between the tumour and the abdomen; but without this the pain or the very great hardness will discover it to be a difcase of the testicle.

As to the cure, little is to be expected either from inward medicines or outward applications. Therefore it will be most advisable to wait till the tumour becomes troublesome, and then to tap it with a lancet.

Of the Jaundice.

The jaundice is a disease which is principally discovered by the yellow tincture of the skin, but most distinctly in the coasts of the eyes, where it gives the first notice of its invasion.

The symptoms are, heaviness, inactivity, latitude of the whole body, anxiety, uneasiness about the hypochondrium, fickness at the stomach, oppression in the breast, difficult respiration, a dry and harsh skin, coiffuenes, hard white excrements, yellow high-coloured urine, which will tincture linen or paper with a saffron hue; there is a bitter taste in the mouth; and all objects seem to be discoloured.

The immediate cause of a jaundice is an obstructed excretion of the bile from the vesica felsis and liver into the duodenum; which being forced back upon the liver, mixes with the blood, by which it is carried into the whole body, whence the skin and urine will be tinctured with the colour of the bile.

This obstruction may be occasioned by any thing in the duet, which plugs up the paffage, or by external pressure closes its mouth, or by a palp contradic the fibres thereof. Hence we may, conceive why the jaundice succeeds the flatulent ecule, why pregnant women are
tion or fever of the liver, and has not continued long, difficult.

When the patient is young, the disease not complicated with any other, such as a quartan ague, the affection hypochondriaca, or an obstruction or stricture of the liver, and has not continued long, it is easily cured. But if after the cure it frequently returns, with a yellow greenish colour, and an induration of the liver, it generally terminates in a hectic or an haemorrhage. A jaun-fice arising from violent transports of anger, or the spasmodic perturbation of the intestines or biliary ducts, caused by a draffic purge or emetic, is easily cured if taken in time; but if encouraged by grief, or the body is weakened by a previous disorder, the cure is more difficult.

Emetics are highly proper in the cure of the jaundice, and yield speedy relief, if the disease does not proceed from violent anger, spasm of the flomach, a cardialgia, a spasmodic colic, or a stone lodged in the cystic duct, exciting a violent uneasiness about the precordia. But when a bilious fordes, lodged in the duodenum, and closing up the oriifice of the ductus choledochus, intercepts the passage of the bile; or when a tenacious, moveable, and not highly concrected bilious matter, plugs up the hepatic ducts, emetics are of singular efficacy in evacuating it. A scruple of ipecacuanha, with a grain of tartar emetic, will be a proper dose; or two grains of tartar emetic, in a draught of generous wine, or in an infusion of manna, drinking water-gruel after it.

Likewise in this case, after emetics, cathartics will be proper, compounded of aloetics and mercurials: Then faponaceous attenuants, preparations of tartar, and volatiles.

And here we must recommend the terra soliata tartari, otherwise called tartarum regeneratum, and by the college, Sal diureticas, as the greatest diolvent, and the most powerful remedy in this disease. It dissolves the most tenacious substances, and opens all obstructions of the visera; and yet has no acrimony, and may be safely given in the pleurisy and dropsey. Its dose is from five grains to a scruple and upwards.

When a jaundice is attended with an haemorrhage, it is always dangerous, because it denotes a most acrimonious and disolved state of the blood; in which cafe, attenuants, aloetics, volatiles, and chalybeates, are little better than poison; whereas acids, diluents, demulcents, and mineral waters, are very beneficial. Hemp-seed, boiled in milk till it breaks, is often advantageous, [the dose is 5 ounces twice a-day] or an emulsion of white poppy seeds and sweet almonds, after moderate bleeding, (if the patent is feverish, and the pulse will allow it) and gentle purging.

Neither
Neither bleeding nor cathartics have any place in the cure, for they exacerbate the distemper; nay, the most gentle emetics are prejudicial: For this distemper seems rather to proceed from a disorder of the spirits, than from a fault of the humours. It will be proper first to advise the patient to drink upwards of a gallon of polet drink, to clear the stomach of its impurities, by throwing it up again, that the effects of the purgative may not be hindered. Afterwards give 25 drops of the thebaic tincture, in an ounce of cinnamon-water. This last is to be repeated at due intervals, till the symptoms disappear; that is, the effect of one dose must be known, before another is given. Yet sometimes, in phlethoric bodies, if the strength will permit, it is better to prepare the way, by bleeding and purging, or both, for an anodyne.

Of the Flatulent or Wind Colic.

If there is a fixed and tenacious pain in the right or left hypochondrium, or beneath the stomach, it is a certain sign that there is wind or excrements pent up in the flexures of the colon. If the pain is in the small guts, the abdomen will be wonderfully swelled and puffed up; and the force of the wind is often so great, and it dilates the skin to such a degree, that the pain is exacerbated merely by touching it; nor do there want instances of a navel rupture arising therefrom. The pains are very acute, the body extremely colic, there is a fever of a very great strictness or contraction; and if the stomach is inflamed, the breathing becomes very difficult, and the eruptions are attended with some small relief. Afterwards there are cardialgic passions, and an ineffectual reaching to vomit.

If the disorder lies in the flexures of the colon, emollient and diffusive emetics will be proper, as also carminative and emollient liniments applied to the painful part.

When the body is opened, it will be beneficial to give some lenient purge, as manna, cream of tartar, terra fylla late tartari, with a spoonful or two of oil of sweet almonds.

While the pain is violent, the infusion of chamomile flowers and yarrow, in the manner of tea, frequently drank, is a very powerful remedy.

It will be also beneficial to apply hot bricks or tiles to the part affected; also bags with parched oats and carminative ingredients, as caraway seed, juniper and bay berries, with decraptated salt. A clyster of the smock of tobacco, blown through a pipe into the anus, is reckoned an excellent thing.

When indurated faces plug up the intestinum rectum, so that the wind and feybals can make no exit, then the anus is to be fomented with emollient decoctions; and saline suppositories, with fat, are to be used; also some ounces of linseed oil, with an emollient decoction in which venic soap has been dissolved, are to be injected as a clyster.

Of the Colic from Fumes of Lead.

This is a distemper to which all workers in lead are subject; and is attended with an intolerable pain in the intestines, and a most collyw body: the navel is drawn inward, there is the highest inquietude and a contraction of the joints, attended with a nausea, and a constant reaching to vomit. It is apt to terminate in a kind of palsy, or a spasmodic lumbago, and afflicts the patient a long time. It is sometimes owing to the rathsness of medicators, in giving preparations of lead in the gonorrhoea and other distempers.

There is no better preservative against this distemper, than by taking fat broth in a morning; the cure is to be attempted with oleous emetics, and a plentiful use of oil of sweet almonds taken by the mouth, with or without a solution of manna, by which the desired end will generally be obtained. For the cure for the paralyse, baths of sweet water are necessary; after which the spine of the back must be anointed with a liniment made of the fat of a hog, expressed oil of nutmegs, fassfron, and oil of rosemery, which is a speedy and a certain remedy.

This disease is called mill riff by the miners at lead-hills in Scotland, which all the inhabitants have subject to; but mellers of lead have it with the greatest violence.

In the lighter stage of it, there is an uneasiness and weight about the stomach, particularly near the cartilage eniformis, and sometimes it is like a colic in the intestines. The spittle of the patient is sweet, and inclining to a bluish colour, resembling that of a person who chews lead.

The pulse is quick, and the skin is all over cold, with frequent clammy sweats. The legs become feeble, with a prickling numbness; and the whole body is lazy and feeble. Sometimes a spontaneous diarrhoea carries off the disease; but if it continues long, it is very prejudicial. During this stage the patient is able to work.

When these symptoms continue long, and spirituous liquors are drunk on an empty stomach, or after the working of lead, the second stage comes one; and then there is a fixed pain in the stomach and guts, especially in the lower part of the belly, extending from one hip-bone to the other, with colliquescence and a gnawing pain. The pulse then becomes weak, and the skin hot. There is likewise a giddinefs and a violent pain in the head, which is succeeded by an insensibility and a delirium of the worst kind; for they bite their hands and tear their own flesh. Then their extremities tremble with convulsions; and at length they sink with an intermitting pulse, and die of a coma or apoplexy.

If proper medicines are given in the first stage of the disease, the patient generally recovers. If it proceeds till the giddines comes on, the success is doubtful; but after that it almost always proves mortal.

Workers in lead should never go to their business fasting, and their food ought to be oily or fat. A glass of salad oil, with a little brandy, rum, or other spirit, is a good morning’s draught; but spirits alone should never be taken while at work, nor immediately after it. Physick should be taken spring and fall, and no man should go into the cold air while hot with labour, and they should change their working-cloaths for others as soon as possible. Liquid aliment is belt, such as fat broth with good meat; for low living is bad. They should now and then go a little way out of the tainted air.

If the patient is phlegmatic, the cure is to be begun with bleeding.
bleeding, and then the 

POSS X VIE must be cleansed with a double dose of emetic wine, or emetic tartar, otherwise it will have no effect. They will even bear half a dram of glass of antimony in fine powder, with plenty of warm water during the operation. If the vomit works well upwards and downwards, the patient is in a fair way of recovery. Then a milder dose of ipecacuanha must be given with tartar emetic. If the dose does not work either way, he is generally the worse for it, and a stronger dose should be given soon after. If it vomiting, but does not purge, an anatominial cathartic, or jalap and mercury should be exhibited in a larger quantity than ordinary, and then the patient should drink plentifully of warm broth. The vomits and purges should be repeated at proper intervals till the disease disappears. If they work too much, an opiate may be given at night, but with caution, for fear of rendering the patient colicive, which is the worst thing that can befall him. When purgatives do not operate sufficiently, emollient, laxative, and anodyne clysters must be injected frequently to empty the guts.

OF THE IliAC PASSION.

The iliac passion is a pain in the small intestines, apt to turn to an inflammation, in which their peristaltic motion is inverted, and their contents, and even the excrements themselves, are voided by the mouth in vomiting. Nothing will pass downward, not so much as a flatus.

It is preceded with coughing, which is soon followed with most sharp and violent pains, with an inflammation, distension, and a tumour of the umbilical region, which feels hard to the touch; the body is so bound, that neither wind nor excrements can pass downward: Soon after, the wind first makes its way upward, then comes on a nausea and a frequent vomiting of a bilious and putrid matter: The breathing grows difficult, and whatever is eaten or drunk is soon thrown up again; reddish faces, with a flinking smell, are afterwards forced up by vomiting: This is succeeded by loss of strength, a preternatural heat, a hard and contracted pulse, with great thirst; the urine is red, and voided with difficulty. When the vae becomes desperate, a hiccup and delirium appear; the nerves are distended, the body is all in a cold sweat, and violent convulsions and fainting fits put an end to the tragedy.

In some who have been dissected, the gut seemed to be twisted; but most commonly one part of the gut enters into the other. This disease may also proceed from a rupture either of the scrotum or the groin; from poisons; from anything that stops up the passages through the small guts, such as hard dry food, quinces, pears, unripe acerb fruit, when eaten in large quantities; to which drinking little, a sedentary life, and melancholy disposition of mind, will greatly contribute. These all tend to harden the faces. The gross intestines may also be plugged up with sybols; especially if a person, either through shame, or for want of convenience, does not listen to the calls of nature.

As to the prognostics; there is hope of recovery while there is no inflammation, and while clysters are admitted into the body, and rendered back the same way; as also while the pain shifts from one place to another, and the pain and vomiting are not continual; likewise when the disease proceeds from causes obstructing the intestines. The hope is still greater, if laxative medicines begin to make their way downward. But if there is an inflammation, which is known from a fever, the vehemence of the pain, a suppression of urine, a hard and quick pulse, an unquenchable thirst, a toasting of the body, and extreme debility, with coldness of the extreme parts, the case is desperate. A sudden cessation of pain, and absolute want of strength, with a weak pulse, fainting fits, and a flinking breath, show the intestines are mortified.

As to the cure; first of all it is necessary to bleed in the arm, and afterwards, in an hour or two, exhibit a powerful clyster. The smoke of tobacco blown into the bowels, through an inverted pipe, is very efficacious: This may be repeated after some time, unless the effect of the first renders it unnecessary. If the disease will not yield to this, a pretty strong cathartic is advisable.

If the patient cannot retain the cathartic, let him take 25 drops of the thick tincture in half an ounce of spirtuous cinnamon water; and when the vomiting and pain remit, let the cathartic be repeated; if the pain returns, give the anodyne again, and repeat it every fourth or sixth hour till the intestines are easy, and the cathartic begins to pass downwards.

After the pain has been mitigated with anodynes, a tapas, which should be applied to the hypogastric region to stop the vomiting and hiccup; which may be composed of equal parts of old venice treacle and expressed oil of nutmegs, with the addition of oil of mint and camphor. This done, a gentle laxative of manna, cream of tartar, and oil of sweet almonds, may be given.

When there is an inflammation, nothing is better than six or eight grains of purified nitre, and half a grain of camphor mixed with some antispasmodic powder, and taken in a convenient vehicle. Outwardly apply a liniment of an ounce of axungia humana, any other penetrating fat will do as well] and a dram of camphor.

But when other things fail in the cure of the iliac passion, recourse must be had to quicksilver, which sometimes has surprising effects; half a pound, or a pound at mol, is sufficient, with fat broth or oil; and the patient should lie on his right side, or walk gently about the room, that its descent may be easier. But if there is an actual inflammation, the use of quicksilver should be forborne; if the patient dies, from what cause soever, the bystanders will probably affirm the quicksilver killed him.

There is no manner of danger in the use of opiates, to mitigate the pain, provided they are exhibited in the beginning, after bleeding, or before there are any signs of a mortification.

Clysters are generally very advantageous; for they relax the spasms of the gross intestines: and for this purpose warm water with syrup of marshmallows will be sufficient; and if the strength will permit, they should be injected every two hours, from the first day of the attack. They likewise restrain the inversion of the peristaltic motion, and soften the faces.
VOMITING.

Vomiting is a spasmodic, retrograde motion of the muscular fibres of the oesophagus, stomach and intestines, together with strong convulsions of the abdominal muscles and diaphragm. Those that are slight, create nausea; those that are strong, vomiting.

Vomiting generally begins with a nausea, a tension and weight in the epigastic region, a bitterness in the mouth, anxieties of the precordia, plenty of thin saliva in the mouth, a trembling of the neither lip; to these may be added, a dizziness of the head, a sudden dimness of sight, redness of the face, a fruitless eructation; and then the contents of the stomach are discharged upwards.

Vomiting is caused by excesses in eating and drinking; by the acidity of the aliment; by the translation of the morbid matter of ulcers, the gout, erysipelas, and other diseases, to the stomach; from a looseness or bloody flux too suddenly stopped; from a congection of blood in the stomach, which happens to women in the first months of pregnancy, or when there is a suppression of the menses, or bleeding piles; from sympathetic, by tickling or irritating the throat or oesophagus with the finger or a feather; from the colic, iliac passion, a rupture, fit, of the gravel, worms; from poisons; from hurts of the brain, such as contusions, compressions, wounds or inflammations of the diaphragm, stomach, intestines, spleen, liver, kidneys, pancreas or mesentery; from an unusual motion of the spirits in a cart, coach, or ship; from the idea of some nauseous thing, or which has formerly occasioned sickness or vomiting; from a regurgitation of bile into the stomach.

As to the prognostics; a critical vomiting is salutary; a symptomatic bad; and that which proceeds from a subtil caustic acrimony, which vellicates the nerves, worst of all. All violent excessive vomiting is bad, as it may occasion abortions, ruptures, &c. Bilious vomiting, especially the green, porraceous, and claydenous, confiding of a corroding acid, portends danger of an inflammation; vomiting from worms which gnaw the stomach, is generally pernicious; vomiting of dead worms, if at the same time the convulsions of the limbs and other grievous symptoms suddenly cease, shews a mortification. All faeculent vomiting is a sign of internal corruption, and therefore bad.

When vomiting proceeds from a depraved digestive faculty, by bitters, candied orange-peel, &c., the stomach is made to press on the stomach, and accelerate the discharge of its contents; but if an inclination to vomit, from the same causes, comes on unawares, a prettily strong and often repeated friction of the hypogastric region with the hand, will prevent it.

Pituitous vomiting, from crudities of the primary vitiated blood, is best cured by a vomit, and especially if there is a troublesome reaching to vomit attended with a nausea and a cardiaalgia; then having first prescribed neutral farts, or squills, to incite the phlegm, give warm water mixed with unaltered butter, very plentifully, or powder of ipecacuana.

Bilious vomiting, which proceeds from a depraved digestion, and has its seat in the duodenum, is cured by absorbents and gentle laxatives of manna and rhubarb. When it proceeds from too great a laxity of the biliary ducts, then cortex Peruvianus, cortex eleuteria, and bitter tinctures and chalybeates, will be most efficacious; if from a coagulum or stone in the gall-bladder, mineral waters are more likely to succeed.

When vomiting is caused by a sharp matter vellicating the nerves of the stomach, proceeding from the gout, or an erysipelas, besides giving quieting medicines, it ought to be drove back by diaphoretic powders, with a small addition of camphor. Also externally, frictions, pellucia, and clysters, are useful.

When it proceeds from poisons, nothing is better at the beginning than drinking large quantities of milk, and fat oily things, to shelf their acrimony, and bring them up by vomiting.

Vomiting from a suppression of the menses, or from the o污染防治 of the bleeding piles, is cured by absorbents, by gentle laxatives, by clysters and strengtheners; and more especially by bleeding or causing the flux to return. Emetics, in this case, are as bad as poison, and either cause a vomiting of blood, or a fatal inflammation of the stomach.

Morning teachings, caused by hard drinking, are cured by absorbents and anti-acids, and by strengthening the digestive faculty, by bitters, candied orange-peel, &c.

The immoderate and frequent vomiting of pregnant women requires bleeding in the foot, and rest both of mind and body.

VOMITING of Blood.

Vomiting of blood is generally preceded with a terrific pricking pain in the left hypochondrium; and the eruption itself is almost always attended with anxiety of the precordia, and a compressing pain, as also a kind of girding on the same side. It is frequently attended with fainting fits, especially if the blood has an ill smell, or is corrupted.

The seat of this disease is in the stomach, though the spleen sometimes has a share in its production. Persons more subject to it are the lean and slender; women irregular in their menstrual, and who have been hastily cured of intermittent fevers, which has brought on a suppression of the menses, and then have taken hot forcing emmenagogues; as also women about the time their menses leave them; likewise plethoric women in the time of pregnancy, and hard labour; and men of a weak constitution, subject to the bleeding piles, which either cease to flow, or flow in too small a quantity.

The danger which attends this disease, is not the same in all, though no hemorrhage is more dangerous than this. If there is no fever, and if it proceeds from suppressed evacuations, caused by a plethora, the cafe is not to deter your. On the contrary, if there is a fever; if the blood is corrupted, flaming, and black; if it proceeds from a large, diseased spleen, or an indurated liver, attended with swooning; there is no hope of recovery left. It is still worse, when the flowers are black; then the seat of the disease is in the ilium, from a rupture of the mesentric vessels.

In the paroxysm, if the patient is plethoric, bleed according to his age and strength.
A diarrhoea is a frequent and copious evacuation of liquid excrements by stool; and may proceed from aliments, or humours of various kinds, derived from different parts into the intestines.

The cause is a stimulus which irritates the visera, occasioning the expulsion of their fluids; and may therefore proceed from the vessels of the liver, pancreas, metentery, and intestines; when at the same time the mouths of the mesenteric veins and the fistulae are obstructed. Or there may be an extraordinary laxity of the intestinal fibres; or, lastly it may arise from a stoppage of other excretions. It is frequently attended with gripings.

The patient is weak, makes but little urine, has a depressed pulse, a depraved appetite, and is sometimes feverish.

In a diarrhoea arising from sharp fermenting juices in the prime vitæ, which accelerate the peristaltic motion of the intestines, the first indication is to discharge the stimulating matter; which may be effected by a dose or two of rhubarb.

At night the patient may take fifteen drops of the thebaic tincture, in two or three spoonfuls of simple cinnamon water. The rhubarb is to be repeated till the looseness abates, which is generally after the second dose.

If there is a fauburra of ill concocted matter in the stomach, a vomit will be necessary of ipecacuanha, [or an ounce of its wine.]

If the diarrhoea continues to be violent, it will be proper to mix astringents with the rhubarb.

If the diarrhoea proceeds from suppressed perspiration; and if the stools are thin, and the patient feverish; first bleed, then give an emetic, afterwards a purge of rhubarb, and last of all astringents.

But the best and safest astringent of all is logwood, given in decoction.

A bilious diarrhoea ought not to be too suddenly stopped, but the humours are to be corrected gradually; for which purpose, a scruple of rhubarb slightly toasted, with a few grains of nitre, is very useful. Likewise half a dram of the expressed oil of nutmegs, either alone or mixed with a grain of opium, and given in broth, is very efficacious. The humours are likewise corrected with thin emulsions of almonds and white poppy-seeds, with the addition of diacodium.

When a diarrhoea is very obstinate, after toasted rhubarb has been given for some days, prescribe a sweat with a dram of new Venice treacle, and twelve grains of burnt hartshorn, calx antimon, and purified nitre.

An habitual diarrhoea is greatly relieved by wearing a flannel shirt, and keeping the body warm.

In Vol. I. of the London Medical Observations and Inquiries, Dr. Pye proves, by a long enumeration of instances, that in all loosenesses where emetics are advisable in every age and sex, though the patient be in the weakest circumstances, ipecacuanha, from half a grain, to four or six grains, may be given with the utmost safety, and will seldom fail of answering the intention of the prescriber; and adds, that for many years he had experienced the great efficacy of it, in curing or shifting in the cure of diarrhoeas in children, when administered in clysters.
MEDICE.

Of the Cholera Morbus, or Vomiting and Looseness.

A CHOLERA, or vomiting and looseness, is a sudden violent purging upwards and downwards, proceeding from a convulsive contraction of the stomach and intestines, caused by sharp caustic matter of various kinds.

It generally begins in August, and seldom reaches the first weeks of September, unless it be a spurious kind which arises from excess.

It discover itself by enormous vomiting, and a voiding of vitiated humours by flux. There is a violent pain, inflammation and distention of the belly and intestines, also a cardialgia and thirst; the pulse is quick and frequent, small and unequal; there is heat and anxiety, a most troublesome nausea, sweating, a contraction of the legs and arms, fainting, coldness of the extreme parts, and the like which kill the patient in twenty-four hours.

Though this disease is generally preceded with acid, noxious belchings, purgant and cardialgic pains in the stomach and intestines; yet soon after, all of a sudden, and at the same instant, the vomiting and looseness make their attack. The remains of the last meal are voided first; afterwards bilious humours, mixed more or less with mucus; then those that are yellow, then eructs, then black, often exceeding acid, and almost corrosive, together with frequent expectorations and wind, and sometimes blood itself. The returns of the evacuations are very frequent. Besides, there is most acute, wringing, gripping, gnawing, biting pains, with inflammation and swelling of the intestines, chiefly above the navel, and most racking cardialgias. As the disease increases, the thirst becomes great, the extreme parts grow cold: there is a palpitation of the heart, and then hiccups; the urine is a dark purplish, then black, death is inevitable. The case is as bad for old persons, or children, or such as are weakened with the more intense are the thirst and heat, and the more certain the danger. If it be black bile, and mixed with black blood, death is inevitable. The case is as bad when there are faintings, hiccups, convulsions, coldness of the extreme parts, and cold sweats. Nor is any thing better to be expected from a flippage of the evacuations, while the rest of the symptoms continue. But if the vomiting ceases, and the patient sleeps soon after, or the disease is protracted beyond the seventh day, he may recover; if he begins to break wind downward, it is a good sign.

This disease requires the most speedy assistance, and therefore the physician cannot be called too soon. The indications of cure are, 1. To correct and heal the morbid matter, and to fit it for evacuation. 2. To appease the irregular spasmodic motions. 3. To strengthen the nervous parts which the disease has weakened.

Boil a large chicken in three gallons of water, that so there may be a taste of the flesh, and give the patient a large quantity of it to drink; or, for want of it, a warm pint of water, and large quantity of it to drink; or, for want of it, a warm posset-drink; and also repeated Clysters of the same liquor; now and then an ounce of syrup of violets may be added to the draught or clyster. These operations may be completed in three or four hours, and then a paregoric will crown the whole.

But if the physician is not called in time, and the patient has been exhausted with vomiting and purging for many hours, and the extreme parts begin to grow cold, then immediate recourse must be had to liquid laudanum in a large dose. And when the symptoms cease, it is to be repeated morning and evening, till the patient’s strength returns.

Neither cathartics nor emetics, properly speaking, are of use in this disease; but the vomiting may be promoted by drinking a large quantity of warm water mixed with fresh butter or oil; and the purging by oily and emollient clysters. Or the patient may drink small chickens broth. Whey is of great use to quench the thirst; to which may be added, the absorbent and teffaceous powders.

If the patient is not too much exhausted, make him drink plentifully of warm water three or four times, to dilute and blunt the acrimony of the humours, and to bring them up by vomiting: Then he must take as freely of a decoction of oat bread, baked without leaven or yeast, carefully roasted, without burning, as brown as coffee; which decoction ought to be of the colour of weak coffee. This is grateful to the stomach, and is seldom brought up again.

When the patient is much exhausted with evacuations upwards and downwards, give him a large draught of the decoction; and, when the nausea is pretty well settled, two thirds of a grain of opium, more or less, according to the strength and age of the patient.

But if the patient is convulsed, the extreme parts cold, and the pulse weak and intermitting, twenty-five drops of liquid laudanum, in an ounce of strong cinnamon water, is more proper; and afterwards a draught of any wine in an equal quantity of the decoction. After this, he may take the decoction to quench his thirst, and a little wine now and then as a cordial.

To prevent a relapse, repeat the opiate in a moderate quantity for some days, morning and evening; and care must be taken not to overload the stomach, or to eat anything but what is of good nourishment, easy to digest, and grateful to the stomach.

Of the Dyseutery, or Bloody-Flux.

A Dysentery begins with shivering and shaking, succeeded by heat of the whole body; which are followed by griping of the guts, and soon after by frequent voiding of slimy stools, attended with violent pain, and a most troublesome pressing down or seeming descent of all the bowels, and this every time the patient has a stool. In process of time the stools are mixt with blood, and afterwards pure blood is only evacuated, and the intestines are affected with an incurable gangrene. Yet sometimes there has been no blood through the whole progress of the disease.

If the patient is in the flower of his age, or has been heated with cordials, he is very feverish, his tongue is Whitish,
whitish, and beset with a thick mucus; sometimes it is black and dry; he becomes excessively weak, and is quite delirious; a purple or a thrush appear in his mouth and throat, especially if the evacuation of the morbid matter has been improperly prevented by astringents, and the fomes of the disease has not been expelled by cathartics. Sometimes, when a fever is abating, the gripes lead the van, and the rest of the symptoms follow.

Those whose stomachs are loaded with much indigestible matter, are troubled with a nausea, reaching and vomiting; many have an intolerable heartburn and anxiety of the praecordia. All are afflicted with a perpetual desire of going to stool, and such a violent tenesmus as is not seldom attended with a procidentia ani.

In febile, the extreme parts are cold, while the inward seem to burn, and a perpetual sense of heat and a pulsation torture the intestines. To these succeed hiccups, cold sweats, a pale countenance, walking of the body, inflammations, and aphthae of the fauces. At last, all pain ceases at once, the thirst vanishes, the stools come away insensibly with a cadaverous fcent, the pulse becomes flenser, and death is at hand. This disease is often contagious.

Prognostics. Dyfenteries are dangerous to pregnant women, to old men, and to boys. There is commonly little hope when it attacks the scrophulous, the consumptive, and the cachectic; those that are weak and afflicted in mind, or troubled with worms. When it begins with vomiting, succeeded with hiccups, there is danger of an inflammation of the stomac. Nor is the case better when the stools are green, black, mixed with caruncles, and of an offalme fcent. It is a fatal omen when chlysters are immediately returned, or the anus so obstinately closed that nothing can be injected; for it is a sign of a palsy of the rectum. When the pulse is weak, the extreme parts cold, and the inward burn, or are without sense, nothing good can be expected. When swallowing is attended with a murrining noise, it shews the approach of a delirium, an inflammation of the fauces, aphthae, or a palsy of the whole otopus. It is necessary to know, that this disease sometimes quickly terminates, especially if there be a malignant fever, and then it kills in seven, nine, or fourteen days; sometimes it does not cease till the fortieth or upwards; when it continues a long while, it either kills the patient, or brings on a dropy, a leantery, the celiac affion, a tabes or hemicrania; it is a terrible disease in Ireland, when all other remedies failed.

Hoffman directs a scruple or half a dram of the ipecacuanha, when it begins with vomiting. After the first vomit, give two or three grains of ipecacuanha every eight or ten hours, in a bolus, with diaezordin, or the like, with some proper julep. Hoffman would have the rhubarb given in substance, that is, half a dram in powder; Dener gives it twelve hours after the vomit, repeating it in small doses.

Mr Ray says, that the fomous substance between the lobes of a walnut, dried and powdered, and given in a moderate quantity in wine, cured the English army in a terrible dysentery in Ireland, when all other remedies failed.

Jussieu says, a thick yellow bark, called simaruba, has been found successful in the cure of a dysentery. The dose is a third part of a quart of a decoction made with two drams of the bark. And Cramer assures us, we may depend upon the same effect from the decoction of common millet-feed, called St Ambrose's syrup, which Luther looked upon as a cure for the colic. Count Argenton took it first by his advice, merely to quench his thirst, in the manner of tea, by which means he got rid of his thirst and dysentery in twelve hours time.

Another specific is the vitrium antimonii ceratum, which has been in use for some time, but was kept a secret till it was communicated by Dr Young of Edinburgh to the public.

The manner of preparing it is as follows:

Take of glafs of antimony in powder, one ounce; bees-wax, one dram: melt the wax in an iron laddle, then add the powder: let them on a draw fire without flame, for the space of half an hour, continuously stirring them with a spatula; then take it from the fire; pour it upon a piece of clean white paper, powder it, and keep it for use.

The ordinary dose for an adult is ten or twelve grains; but for greater safety begin with six.

Never give opiates in the beginning, especially where there is great sickness; because, though opiates give relief to some, yet at other times both the ficks and purging increase the following day.

Bonitus, in his account of the diseases of the East-Indies, affirms, that extract of saffron is a specific in the dysentery of those parts, even though it should proceed from poison.

Of the Head-Ach.

The head-ach is a most troublesome sensation in the nervous membranes of the head, produced by various causes, and attended with different symptoms, according to its different degrees, and the place where it is seated.

The most common seat of this disease is the pericranium; a membrane which invells the skull, coheres with the muscles next the skull, and is joined to the dura mater by some fibres which pass through the future. It is a thin nervous membrane of exquisite sense. It may likewise be in the skin that covers the skull, and in the dura mater. This last but seldom happens; but when it does, it is very dangerous. There may likewise be a very acute pain in the thin membrane which covers the sinuses of the os frontis.

If the head-ach be slight, and affeds a particular part of the head, it is called cephalalgia; if the whole, cephalae; if one side only, hemicrania; if there is a fixed pain on the forehead, which may be covered with the end of the thumb, it is called clavus hyflericus.

The general cause of the head-ach is a hindrance of the free circulation of the blood through the vessels of the head.
When the blood rushes with impetuosity, and in too great plenty into the membranes, which may happen to the plethoric, to those whose usual bleeding at the nose is suppressed, and to young persons, there is a pain in the whole head, which becomes hot, swells, aches, and looks red; the vessels swell, and there is a strong pulsation in those of the neck and temples. The nostrils are dry and parched, there is a burning heat and drought in the fauces.

When the vessels of the head are stuffed with a mucous serum from a fopagination of the running of the nose, then there is a heavy, obtuse, pressing pain, chiefly in the fore-part of the head, in which there seems to be such a weight, that the patient can scarce hold it up. Sometimes the skin is so swelled, that it will pit.

Sometimes it happens from the feverous, sharp, caustic matter of the French disease, which infects the periostium, and often causes a caries in the skull.

Sometimes it may proceed from matter of a saline caustic nature, driven back from the external parts; as, in the gout, itch, erysipelas of the head, gutta roacea; in the small-pox and measles, before the morbid matter is expelled to the outward skin, or, which is worse, when it is driven back. In these cases, when a small quantity of caustic matter causes the pain, it rather proceeds from a violent stricture of the membranes than from their disposition.

There is likewise a most violent, fixed, constant, and almost intolerable head-ache, which brings on a debility both of body and mind, hinders sleep, disturbs digestion, destroys the appetite, causes a vertigo, dimness of sight, blindness, a noise in the ears, convulsions, and the epilepsy; and, by consent of the other nervous parts of the body, produces vomiting, colic, coldness of the extreme parts, and the countenance of a dying person.

Sometimes the head-ach is symptomatic, and attends upon continual and intermitting fevers, and especially the quartan irregular flowing of the menphis, the hypochondriac passion, and the like. A hemicrania generally proceeds from a fault in the stomach, from crudities or indigestion, and commonly appears when digestion is performed.

The head-ach is not always without danger: if the cauſe of the pain is within the skull, and is violent and constant, attended with a fever and want of sleep, it portends a phrensy. If it sudenly attacks the hypochondriac; or those that are prone to melancholy, especially if preceded by a violent passion of the mind, and deprives the patient of sleep and appetite, and is joined to difficulty of hearing, and an internal pulsation of the vessels, and all these without a fever, it preages madness. But when the pain in the head is sudden and very acute, with a noise in the ears, difficult walking, a weakness of the body, produces vomiting, colic, coldness of the extreme parts, and the countenance of a dying person.

The curative indications are, 1. To divert the impetus of the blood and humours from the head, and to diffuse them by suitable remedies. 2. To relax the spatical stricitures of the membranes of the head, the cauſe of which is a sharp caustic matter, that the fluids may have a freer circulation. 3. To correct the peculant matter, and evacuate it gently through the most convenient eminenturies. 4. To prevent a return by strengthening the whole nervous system by proper remedies, and especially by an accurate diet and a suitable regimen.

When the head rushes to the head in too great quantity, bleeding is necessary, more particularly under the tongue, in the forehead, in the jugulars, or by leeches behind the ears. If the body abounds with too much blood, it will be best to bleed in the angle first, and the next day, or the day after, in a vein about the head. But first of all cleanse the body by any emollient clys, or by giving an infusion of rhubarb and manna, with cream of tartar.

To refrain the organ of the blood, it will be proper to give a diaphoretic and absorbent mixture, with diaphoretic antimony, purified nitre, burnt hartshorn, and diaedemum, diluted with a sufficient quantity of suitable simple distilled waters.

When there is an intense pain remaining fixed in one place, lying pretty deep in the membranes, the herb ranunculus, used as a vesicatory, has a wonderful efficacy. It is the upright meadow-crawfoot, with leaves like the anemone, and, if tasted, is extremely biting to the tongue. The leaves must be bruised in a marble mortar, and, if hairy, shaved; then a flicking plaiher is to be laid on it, with a hole about the bigness of a silver penny, and the leaves over that; just in the same manner as a caustic. This is an experiment of Chefsnaull's; and like successes may be had by mixing equal parts of volatile sal ammoniac and powder of mustard-seed, laying it on the part in the same manner.

When it is caused by a suppression of a coryza or running of the nose, a snuffing-bottle of volatile salts should be held frequently thereto. Or the patient may take herb-snuff, with the addition made of flowers of benjamin and powder of cloves.

When the head-ach arises from a corrupted mass of blood and an impure serum, as in the scurvy and lues venerum; a decoction of the woods with crude antimony may be serviceable, after evacuations, lasting a day now and then, with labour and exercise, will likewise be useful; as also a fudorific.

A hemicrania, especially a periodical one, is generally owing to a foulness in the stomack and prime vie; for which gentle emetics will be beneficial, as also purgatives to derive the humours from the head; afterwards stomatics. If it proceeds from profuse evacuations of the menphis or hemorrhoids, those fluxes must be reduced within bounds.

If the head-ach is so intolerable as to endanger the patient's life, or is attended with continual watching, fainting-fits, a fever, an inflammation, or a delirium, recourse must be immediately had to opiates with native cinchaba, after a clyster has been first given.

When there is an intolerable pain in the sinuses of the nose, or the bony sinuses of the head, produced by an extravagination of some fluid, the only cure is levigation of the nostrils, or causing the nose to bleed with a straw suddenly thrust therein.
If there is an extravasation under the pericranium, and the humour is so sharp as to begin to render the bone carious, then recourse must be had to an incision, as in a whitlow.

In some kinds of head-ach, it will be proper to open the frontal vein.

When the patient's strength will not bear the loss of blood, temperate pediluvia will be beneficial, and strong frictions of the feet with a coarse cloth; as also cataplasm of horse-radish and salt laid thereon.

**Of the Heart-Burn.**

The heart-burn is a pain more or less violent about the pit of the stomach, with anxiety, a nausea, and often a reaching, or actual vomiting.

The causes are, vitiated humours in the stomach, velluating and gnawing the stomach itself, or its left orifice, which the ancients call cardia. The stomach thus irritated, a painful sensibility is excited, and spasmodic constrictions, which occasion a nausea and vomiting. But common heart-burns are generally without vomiting. The heart-burn may also proceed from wind and indigestion, and now and then from worms; but more frequently from congestions of blood about the stomach, which may happen to those who are full of blood, but more especially to the hypochondriac and hysterical, when vomiting of blood not seldom ensues.

The cure of a common heart-burn from indigestion and the acrimony of the contents of the stomach, which chiefly happens in a morning with wind, may be performed only by drinking tea or coffee, or a decoction of camomile flowers; as also by taking bitters, or a dram of powder of orange peel, or camomile flowers, in a small glass of water made pretty hot, and sweetened with sugar. The tinctuous and absorbent powders are excellent in this case; such as the tabellae cardiae, or lozenges for the heart-burn, which may be carried in the pocket and taken at pleasure; about a dram is sufficient for a dose.

When it arises from a crampula, gentle emetics will be useful. If the patient begins to vomit without them, large draughts of warm water will assist to cleanse the stomach; or carduus benedictus tea taken freely.

If the cardialgia proceeds from a congestion of blood, and the painful strings then arising, bleeding will be convenient, and emetics hurtful. If the meninges are flopped, bleed in the foot.

Nor must anodyne and emollient clysters be omitted. It will likewise be proper to apply a bladder filled with a decoction of chamomile, pretty hot, to the stomach. After recovery, riding will be convenient to regain the lost strength.

If worms are the cause of the heart burn, no acrid anthelmintics must be given, but warm milk mixed with oil of sweet almonds, which, if drank in sufficient quantity, may cause them to be thrown up.

**Of the Tooth-Ach.**

The tooth-ach is caused by impure serum, which corrodes and rends the ligaments and nervous-glandulous coats, by which the roots of the teeth are kept firm in their sockets, and wherewith they are invested.

It is a kind of rheumatic disorder; for we have often observed that pains of the joints and shoulders have shifted to the side of the head, and have invaded the teeth and gums with violent pain. On the contrary, pains of the head and teeth have fallen into the arms and shoulders.

The feat of the tooth-ach may also be in the cavity or internal parts of the teeth themselves, that is, in the little vesicular cord composed of the nervous membrane, an artery, a vein, and a lymphatic vessel, which may either be distended by stagnating serum, or be affected with a pannic constringence, especially if the tooth is carious, and the caries reaches the said cord.

As in the gout there is a pain, redness, a tumour, and a little fever, so they sometimes appear with the tooth-ach. There is also frequently a copious discharge of saliva, which proceeds from a painful lip, which constringes the lymphatic and venous vessels.

As the rhematism appears in temperate, and a sudden change of weather; so it is with the tooth-ach, especially when the weather is hot and cold by fits.

The whole intention of cure consists in deriving and diverting the impure scorbatic serum from the head, and then carrying it off through proper emunctories; and afterwards in strengthening the parts.

This is to be done by saline, emollient, purgative clysters; by warm pediluvia of rain-water and wheat bran, with venice soap, and used just before bed-time; by laxatives of manna and calis dissolved in whey or affes-milk or mineral waters. If the patient is plethoric or full of blood, bleeding in the foot will derive the humours from the head.

Sudorific remedies are also proper, but more especially an electuary made of rob of elder-berries, burnt hart's-horn, diaphoretic antimony, and a few grains of nitre, which cannot be too highly praised. Or an ounce of the rob may be taken in broth to promote a diaphoresis; and it may be used externally, dissolved in beer, in the manner of a gargle, which will yield immediate relief to the patient.

Outwardly may be applied bags, filled with paregoric and emollient species, such as elder, melilot, and camomile flowers, bay and juniper-berries, caraway and millet feeds, and decrepitated salt. They must be laid on warm, and are very safe.

A drop or two of oil of cloves, or box, applied to a carious tooth with cotton, are medicines not to be despised. Camphorated spirit of wine mixed with saffron, saltor, and opium made into a liniment, and laid to the gums and hollow teeth, often gives the patient ease.

When the tooth-ach proceeds from a rotten, hollow tooth, it will be best to burn the little nervous cord, which is the seat of the pain, with an actual cautery; and then the cavity may be filled up with a mixture of wax and mallich.

If this cannot, or is not permitted to be done, the only remedy left is to have the tooth drawn. But if the patient is plethoric, it will be safest to bleed first, for fear of a fatal haemorrhage.
A small pill, made of equal quantities of camphor and opium, and put into a hollow tooth, is often beneficial. Some greatly recommend a small plaster of tacamahac laid on the side of the face, upon the articulation of the jaw bone, or upon the temples.

But above all, the root of iris lactea, or the yellow water flower, demi lune, rubbed upon the tooth that is painful, or the root itself chewed in the mouth, in an infant, as if by a charm, drives away the pains of the teeth, arising from what cause ever.

It is now become a practice, especially in France, upon drawing a found tooth, to replace it in its socket; where, with proper precautions, it will settle again. Mufgrave is the first who recommends this practice. After the extraction of the tooth, he advises a gargle of honey, mixed with the juice of the herb mercury, common salt, and spring-water, and then to put it in its former place; and adds, it will become more useful than before.

The French operators have improved this hint; and when the tooth is rotten, or otherwise unfit to be replaced, they put another found human tooth in the room of it, when it can be had; otherwise one of any other animal that is of a size suitable for the purpose.

De la Motte, in the tooth-ache, advises to make a small round flicking plaster, about the bigness of a silver groat, and to put a flat bit of opium in the middle of it, of a size not to prevent the adhesion of the other. This is to be laid on the artery near the cavity of the ear, where the pulsation is most sensible. He affirms, there are few cases that this will not relieve.

Of the Ear-Ach.

The ear-ache is a grievous pain in the meatus auditorius, or cavity of the ears, proceeding from a sharp extravasated serum affecting the nervous membrane which lines the meatus auditorius.

This disorder frequently attacks those who are subject to rheumatic and feverish defluxions; or it may arise from a sudden suppression of sweat, or from the head being exposed to cold winds when it is moist with sweating. The cause is often an inflammation or ulcer of the ear, attended with a remarkable heat, and tenfive burning pain, a redness, a fever, and even sometimes a delirium. Sometimes it is excited by worms; and then there is a wandering, cutting, gnawing pain.

The ear-ache is sometimes so violent as to cause a delirium, with the highest inquietude and anxiety, insomuch that the patients often fall into an epilepsy through the violence of the pain.

The ear-ache is sometimes a symptom of acute fevers, when the morbid matter is translated to the ear, as in the Hungarice disease, when deafness or difficulty of hearing arises. When it happens in the declension of a fever, it is a certain sign of recovery; but then the disorder is in the internal part of the ear, and the auditory nerve. When the matter is translated to the external part, then the ear-ache arises; which, unless speedily appeased, may deprive the patient of life. Tho'se who have the ear-ache from a fall, and a famous matter runs out of the ear, are all carried off.

The principal scope is to ease the pain, which may be done with nitrous and cinnabarine powders, and with emulsions of the greater cold seeds; but if these are ineffectual, we must have recourse to opiates, such as the florax pills, or the thebaic tincture.

Outwardly, lay a plaster to the temple of the affected side, composed of maltich, galbanum, saffron, express'd oil of nutmegs, and opium. Afterwards let the ear be held over the vapour of milk, with the fragrant and emollient spices. Also, fill a hog's bladder with the decoction of milk of flowers of mallow, mullein, elder, melilot, camomile, linseed, and a little saffron, and apply it to the part affected. Likewise the smoke of tobacco blown into the ear, and an infusion of millepedes in falad oil, are thought of great efficacy when the inflammation is caused by a sharp serum.

Camphorated spirit of wine, especially with saffron, made pretty hot, and a few drops of it put into the ear with cotton-wool, is a great resolvent; it should also be rubbed into the parts behind the ear. Or oil of almonds with camphor may be used in the same manner; laying over either of them a hot bag filled with resolvent herbs, as sage, pennyroyal, wild thyme, wild marjoram, camomile flowers, Florentine orris, fennel and caraway seeds, with camphor. When the patient is plethoric, bleeding is convenient.

The most violent ear-ache, from taking cold; may be insensibly cured, in a very short time, by applying the ear close to the mouth of a bellied jug, filled with a hot strong decoction of camomile-flowers.

When the inflammation will not resolve, a poultice of white bread and milk, or onions roasted under the cinders, or the like, may be often laid hot to the part affected, till it breaks, or the abscess is evident to the eye.

If the ear-ache is caused by any thing got into the ear, it will be best to relax the membranes by oil of almonds, and then cause the patient to escheeze, which forces it out.

When there is a copious flux from the ear after an abscess, the humours must be diverted by gentle laxatives, blisters, cupping, and pediluvia, if the patient is an adult. It should not be suddenly stopped by externals.

Of the Stone in the Gall-Bladder.

The signs of it are a fixed pain in the right hypochondrium in the region of the liver, which is constant, precluding, heavy, and sometimes acute; often attended with an ill colour in the face. The pain sometimes reaches to the epigastric region and the pit of the stomach. And the exacerbation is so great, at certain intervals, that the gripes and torture affect the whole cavity of the abdomen; joined with inappetence, a nausis, reaching to vomit, anxiety of the precordial, cardial alburn, colicvinae. At length, if the disease be oblitinate, and will not yield to the bell remedies, the jaundice supervenes. Some of these patients are continually afflicted with gripes, and live in this condition for many years, and generally die of the dropsy. Some feel a heavy, obtuse, deep, obilitinate pain, with a tenfe weight, when the gall-bladder is greatly distended with small soft stones.

If the pain continues very intense and sharp, it draws the whole system of the nervous parts into content, causing spastic stristrictures, not only of the adjacent parts, but also...
of the remote; distentions of the arms and joints, epileptic convulsions, and likewise a fever with a hard quick pulse, which shews a large rough stone is firmly fixed in the biliary ducts, that will soon hurry the patient out of the world.

But nothing is a more certain sign that these terrible disorders proceed from gall-stones, than when they are voided with the excrements, and then all the symptoms cease at once, except the jaundice, which disappears by little and little, or is easily cured.

If the stones are soft, and of a light colour; or tophaceous and like mortar of plaster, they most probably proceed from the hepatic ducts: If they are rough, hard, angular, and of a deep colour, they proceed from the gall-bladder, especially if attended with most cruel symptoms in their passage through that slender canal. However, stones have been found in the gall bladder after death, which have produced no extraordinary symptoms.

There are two times of the disease, which require two different methods of treatment; in the fit, and out of the fit.

In the fit, the spasms are to be appeased with anodynes and demulcents, such as oil of sweet almonds, and fresh sperma ceti, internally; externally, the fat of a wild cat, or a beaver, &c.

Demulcents are, milk, sweet whey, emulsions of the cold seeds, infusions or decoctions of marshmallow roots, with wild poppies, elder, syrup of marshmallows.

Powders may be made with crabs eyes, cinnabar, and nitre, with a little saffron, powder of earthworms, elkshoofs, &c.

Externally, emollient epithems, and facculi, filled with carminative ingredients. As also lenient clysters and laxatives of manna, rhubarb, cream of tartar, and the like.

Out of the fits, opening infusions and decoctions; which resolve, disperse, and promote excretions; such as tincture of rhubarb, dog-grafs, asparagus, parley, pimpinel, afterwards adding rhubarb, terra soliata, tartar, or sal. polychred, and syrup of marshmallows, which must be used a long while.

Some praise the roots of dog-grafs, and the juice of dog-grafs, as a specific.

Some use the powder of millipedes with neutral Salts. Epithems made of camomile flowers, leaves of scor-dium, wormwood, and cardus benedictus, elder-flowers, water and red wine, used often in a day, are beneficial.

But if these fail, after long use, the only refuge is in mineral waters, among which the Pyrmont is not the least ineffectual.

These are also properly used by way of prevention, with exercise, and decoctions of the aperient roots.

Of the Gravel and Stone.

A nephritic paroxysm is attended with a fixed pain in the region of the loins, bloody urine, voiding of gravel or small stones, a numbness of the thigh on the side of the part affected, a drawing up of the tefficle on the same side, a naufea and vomiting. After the stone is fallen into the bladder, the urine presently becomes very thick, turbid, blackish, and in great quantity.

When the stone or gravel begins to move and make its way into the ureters, then the pain begins, which is more, or less sharp according to the size and figure of the stone. It is sometimes so violent, that, besides a coldness of the extreme parts, there is a naufea, vomiting, and a spasmodic contraction of the precordia; a difficulty of making water, a conflabilation of the belly, a ftrainings of breath, a fplendor of the thigh, a retraction of the tefficle to the os pubis, inquietude, lobe of strength, a syncope, convulsion-fits, or a fatal fkipage of urine.

When the violent pain has continued for several days and nights without intermission, and has brought the patient exceeding low, attended with an entire suppression of urine, with a coldness of the extreme parts and convulsions of the tendons, it is a sign that death is at hand.

Nor is it a good sign when the stone has continued a long while in the ureter; for then the appetite decays, and a naufea and reaching to vomit supervene, till the patient is confumed with a hectic heat, and the approach of death is hastened. Sometimes the pain is attended with an inflammation of the stomach or intestines. Some, from a fkipage of urine, fall into a dropfy of the bread, a lethargy, or convulsions.

The whole intention of cure conflits in the easy exclusion of the stone, and the preventing the breeding of others.

Hoffman.

If the patient is of a fanguineous temperament, take away ten ounces of blood on the affected side; and then let him drink, as soon as possible, a gallon of posset-drink, in which two ounces of marshmallow roots have been boiled. Then gave an emollient clyster.

When the posset-drink has been vomited up, and the clyster returned back, give a pretty large dose of an opiate; that is about 25 drops of the thebaic tincture, or 15 grains of the pil. faponacese.

Also let a bath or semicupium be prepared, of a decoction of althea roots, linseed, fennegreek seeds, and chamomile flowers; to these may be added, a few white poppy heads.

In the nephritic disorder, the grand point is the evacuation of the subiliary matter lodged in the pelvis of the kidneys, or in the ureters. Bleeding serves to remove the tension and inflammation; and emollient clysters are of a double service, because, by fomenting the flender tubes, they relax the contraction, and, by unloding the lower bowels, they remove the pressure against the ureters. The warm bath opens the passage yet more, greatly relaxing the abdominal muscles, peritonizm, and intestines; the bladder is also relaxed by it, and consequently the oblique infinitation of the ureters through its cellular membranes is less liable to obstruct the evacuation of this sandy matter into its cavity.

By moderate diuretics, and emollient medicines, this discharge is assisted; while anodynes suspend the pain, and procure a paralytic resolution or a spasmodic contraction of the ureters, and thereby contribute not a little to open the passage.

These appear to be the most considerable methods for the relief of this disorder, which is but imperfectly managed without the united affifiance of all, and which, used together, seem the utmost art can furnish.
A turpentine clyster is generally accounted very serviceable in a fit of the gravel.

Haffer recommends the solution per deliquium of the tal diuretics, or the terra foliata tartari, mixed with a fifth part of the thebaic tincture, of which 50 or 60 drops may be given now and then, which will ease the pain, and gently expel the stone or gravel.

When the stone is too big to pass, the diet ought to be cool and diluent, to hinder the growth as far as possible. The diuretics that gently resolve, are parsley, fennel, scorzonera, mallows, and tea; dandelion, succory, oats, barley, honey, honey and vinegar; nitrous salts, as dulcified spirit of nitre; the most soft cooling diluter is whey; the best emollients are a decoction of marshmallows and linseed tea.

When a small stone passes through the ureters into the bladder, it is generally expelled; but if it happens to stay in the bladder, it increases by the apposition of fresh matter, or in an orbicular manner, while the original stone remains like a real kernel. These additional coats are either red, white, ash-coloured, or bluish.

The stone in the bladder may cause an inflammation, with its symptoms; as also prefaces, attractions, ulcers, purulent urine, stranguries, obstructions of the urethra, an inability to discharge the urine, unless in a supine position; a hectic fever, and a consumption. Sometimes the stone gets into the urethra, and plucks up the passage.

A stone in the kidneys may be known from a dull obtuse pain therein; from bloody urine after walking in a rough way, or after violent motion of the body, especially by being shook in a coach or other wheel'd carriage; from having voided stones formerly; and from the urine's being mixed with caruncles, pus, and filaments.

A stone of the bladder is known from a pain at the time of, as well before and after making water; from the urine coming away by drops, or flowing suddenly when in a full stream; by a violent pain in the neck of the bladder upon motion, especially on horseback, or in a coach over the stones; from a white, thick, copious, thickening, mucous sediment; from an itching in the head of the penis; from a tenesmus while the urine is discharged; by searching, with introducing the finger in the anus, or with a catheter; as also from the effects produced by the stone before mentioned.

As to the cure of the stone in the bladder, the medicines of Mrs. Stephens were lately much in vogue as a dissolvent; and Dr. Hartley, by leaving out the superslusive part of them, has reduced them to the following form.

1. Take 2 or 2½ scruples of calcined egg-shells, thrice a day, in any convenient liquid, drinking after each dose a third part of the following decoction.

2. Take 2 or 2½ ounces of Spanish soap, and dissolve it in a sufficient quantity of boiling water; filter, and sweeten with honey or white sugar.

The powder may be taken in three or four spoonfuls of any liquor that is not acid; if the largest quantity of the decoction is taken, it will be best to divide it into four doses.

The egg-shells must be calcined in a crucible eight or ten hours, to bring it to a lime; and then be exposed to a dry air, for six weeks or two months, that is, till they flacken or fall off into an impalpable powder, which must be sifted and put into bottles well corked.

The taking of these medicines must be continued for some time after the complaint ceases, lest any part of the stone should remain, which would be then rugged and unequal, and occasion exquisite pain afterwards.

It is common, after a few days use of these medicines, to have a great increase of pain in making water; at which time, opiates, emollients, warm baths, fomentations, a soft diet, and rest, are proper.

Dr Hales, after several trials of the different ingredients of Stephen's medicines, found that the dissolving power of them lay in the lime. And Dr Jurin, having taken soap-lees, the ingredients of which are potash and lime, beginning with a few drops, and increasing the quantity, till he took an ounce, or an ounce and a half, every day in a proper vehicle, was cured of bloody urine, pain, &c. and passed several stones; after which he had no uneasiness. Hartley thinks the capital soap-lees are best taken in milk, half an ounce of which requires half a pint of milk. He thinks an ounce and a half, or two ounces, may be taken thus every day with perfect safety.

But Hales rightly conjectured, that lime-water alone was likely to have a good effect in dissolving the stone; which put Dr Whytt upon making experiments therewith, which have happily succeeded; whence he proposes the following method of cure.

Let the patient swallow, in any form, an ounce of Alcant soap every day, and drink three pints or more of oyster or cockle shell lime water. If the soap be taken in pills, it may be divided into three doses; the largest may be taken early in the morning fasting, the second at eleven before noon, and the third at five in the afternoon, drinking after each dose a large draught of lime-water, the remainder of which may be drank at meals, instead of the usual liquors.

The disagreeable taste of the lime-water may be mitigated by adding a very small quantity of new milk to it; and is quite destroyed by washing the mouth immediately with a little vinegar and water, and carefully wiping it out again. A dram and a half or two drams of juniper berries, infused in every quart bottle, will mend its taste much. But if the patient dislikes pills, let him dissolve an ounce of soap in a pint and a half of warm lime-water made of shells, which have been long exposed to the weather; and take this at three different times, drinking the rest of the lime-water by itself.

If the shell lime-water cannot be had, let him take the same quantity of lime lime-water, with at least an ounce and a half of soap, because it increases its dissolving power.

If there is an invincible averton to soap, there is reason to think, from experiments that have been made, that oyster shell lime water alone, taken in larger quantities, will have greater effects in dissolving the stone, than lime water even when diluted by soap.

At first the patient should begin with smaller quantities of lime water than that mentioned above, which he may increase by degrees, and ought to preserve in the use of it, especially if he finds any abatement of his complaints or symptoms of the stone's dissolving, for several months, or, if the stone be large, years; during which he should abstain from acid or fermented liquors.
MEDICINE.

For his drink, he may use milk and water, or a potion made with roots of marshmallows, parsley, and liquorice. But if he has been accustomed to more generous liquors, he may drink small punch made without acids. Spirits must not be drank at all, nor the weak punch but very sparingly. It will be also proper to forbear the use of falt meats, honey, and acid fruits, or at most to use them sparingly. Artichoaks, asparagus, spinnage, lettuce, succory, parsley, purslane, turnips, carrots, potatoes, radishes, green peas, may be safely used; but onions, leeks, and celery, should be preferred to most other vegetables.

The patient ought to drink no more of any liquor than is sufficient to quench his thirst; and he should retain his urine as long as he can without uneafiness, that it may have the greater time to act on the stone.

If the lime water occasions suffocativeness, it will be necessary now and then to take a purgative; the most proper are aloes, manna, rhubarb, fenna, or jalap.

Such as have a stone in the bladder, should, while they are taking the medicines, have four ounces or upwards of tepid shell lime-water injected into the bladder every day, and retain it as long as they can without pain, and should evacuate their urine immediately before injection.

Were it not for the trouble of introducing the catheter, an injection might be made at least twice or three times a day; and if a flexible catheter were always kept in the bladder, it might be done at pleasure, and the dissolution of the largest stone quickly procured.

That the injection of the bladder may be more safe, and attended with less uneafiness, a dram of starch may be boiled in six or seven ounces of lime-water, and just be brought to boil over the fire. The fourth part of the yolk of an egg, being mixt with six ounces of lime-water, does not weaken its virtues any more than the starch, and may be occasionally used in its stead.

Such as have no stone in the bladder, but are frequently troubled with fits of gravel in the kidneys, may probably prevent them, by drinking every morning a pint of shell lime-water, two or three hours before breakfast; and though it may be too small a quantity to dissolve the stone, yet it may prevent any new concretions.

Olive the Rheumatism.

The rheumatism chiefly attacks persons in the flower of their age, after violent exercise, or a great heat of the body from any other cause, and then being too suddenly cooled; but spares neither men nor women, old nor young, especially if the person is full of blood depraved with any kind of astringency. The disease is nearly akin to the gout. It begins with chilines and shivering, followed by inquietude and thirst. Which is preceded with spontaneous latitudine, a heaviness of the joints, and coldness of the extreme parts. When the fever appears, there is an inward heat, chiefly about the precordia, attended with anxiety. The pulse is quick and reat, the appetite is lost, and the body collyve. In a day or two, sometimes sooner, the patient feels a rackling pain, sometimes in one joint, sometimes in another, but more frequently in the wrists, shoulders, and knees; frequently shifting from place to place, and leaving a redness and swelling in the part visited last. The pain is exasperated upon the least motion; it sometimes attacks the loins and cox.undix.

When it seizes the loins, it is called the lumbago; and there is a more violent pain in the small of the back, which sometimes extends to the os sacrum, and is like a fit of the gravel, only the patient does not vomit. If this disease is undiscovered, it may continue several months or years, but not always with the same violence, but by fits. If it continues and increases, it may cause a stiff joint, which will scarce yield to any remedy.

Its proximate cause seems to be the inflammation of the lymphatic arteries, of the membranes near the ligaments of the joints, but not so violent as to bring on suppuration. The blood is like that of persons afflicted with the pleurisy.

Take away ten ounces of blood on the side affected. This must be repeated three or four times, or oftener, once every other or every third day, according as the strength of the patient will bear.

The diet must be very thin, and an emulsion of the four cold feeds may be prescribed; and also a poultice of white bread and milk, tinged with a little saffon, may be laid on the parts affected.

If the patient cannot bear frequent bleeding, after the second or third time, give the common purging potion every other day, and an ounce of diacodium at night, till the patient recovers.

If the rheumatism begins with a febrile effervescence, temperate diaphoretics, with nitrous things, in a moderate dose, and often repeated, are beneficial; such as crabs-eyes, burnt hartthorn, amber, cinnabar, purified nitre, with diaphoic and gently anodyne waters, also citron-juice, or its syrup. The common drink should be whey acidulated with citron-juice or cream of tartar; or decoctions of the shavings of hartthorn, roots of forzonera, succory, liquorice, or fennel-feeds.

To purge, it may be proper to chew or eat rhubarb, from two scruples to a dram, with raisins or currants.

In an incipient rheumatism of the shoulders, nothing is better than a blister laid between the scapulae.

But if the patient happens to be plethoric, nothing is better than a decoction of the fudorifie woods, to the quantity of a quart a-day, for a month or six weeks together.

This last is good in the venereal rheumatism, when afflicted with crude antimony and mercurius dulcis.

Young persons who are temperate livers, and not addicted to strong liquors, may be cured by a simple refrigerating diet, and moderately nourishing, as certainly as by repeated bleeding; for instance.

Let the patient live four days upon whey alone; and after that white bread may be allowed for dinner, and on the last days of his illness, he may be allowed it for supper. When the symptoms cease, he may be allowed boiled chickens, or other things of easy digestion; but every third day he must live upon whey only, till his strength returns.

Boerhaave's method of cure is to the same effect, only he advises warm baths and strong blisters to be laid upon the parts affected, nay, even cauteries themselves.
MEDICINE.

 Arbuthnot says, cream of tartar in water-gruel, taken for several days, will abate the pains and swellings considerably, by its acidity correcting the alkaline salts of the blood.

Ridley used mercurius dulcis in rheumatic cafes, as a purge, with good success, giving a scruple in conserve of violet over night, and three pints of eplom waters, evaporated away to one half, in the morning.

Dr James has wrote a treatise to prove the efficacy of mercurial preparations, as well in the rheumatism as in the gout, which is supported with very good authorities.

And Huxham says, that the obdinate rheumatic pains, which remained after the epidemical fever of 1737, would yield to mercurial cathartics; but he preferred to apply to the patients what he calls the essence of antimony, which is of itself but emetic wine made with glaft of antimony, with the addition of a little spicy stammack. This, given to 20 or 30 drops, operates by gentle sweats, and purges in a larger dose very mildly.

Hoffman likewise recommends mercurials and antimonials in particular cafes; that is, when a violent and obdinate pain afflicts the lower parts of the body, about the offa fchii and the os coccic, and the patient is of a robust constitution, then the more powerful chemical medicines may be made use of, such as mercurius dulcis, the folar precipitate rightly prepared, or the medicinal regulus of antimony, to which a decoction of the sudoulic woods may be added. From such medicines as these great relief may be expected.

Cheyne says the hot and inflammatory rheumatisms have all the symptoms of the gout, and like it change from place to place, and by over violent evacuations may be transmitted upon the noble organs. And by the way it may not be amiss to observe, that excessive bleeding, and other violent evacuations, constantly bring on a hectic or dropisy of the patient in this cafe; diseases of a much more dangerous nature in themselves, and far more difficult to be cured, than the original one. And therefore in this disease, only promoting so much bleeding as will prevent a fever and mortification, and somewhat abate the pain (which gentle doses of calomel and gum guaiacum will do more effectually, than not more speedily, than bleeding itself) the rest is to be done by large doses of the bark and ethiops mineral mixed; and a relapse prevented by gentle doses of gum guaiacum, with antimony diaphoretic, and cinnabar of antimony.

Pringle observes, that rheumatism is generally mild, though they sometimes appeared with all the violence taken notice of by Sydenham. For which reason the first fort were generally cured in two or three days by twice or thrice bleeding, and promoting a diaphoresis by the cooler medicines, particularly by vinegar whey. But if it was intended with an inflammatory swelling of the joints, sweating was improper, and the cure was only to be obtained by repeated and almost daily bleedings. But then it is to be carefully remarked, that those were afflicted with it who were both able to bear these evacuations; and in this disease he thinks frequent bleedings weaken the body less than in any other.

If the pain and swelling of the joints remain after this treatment, three or four leeches must be applied to the part where the inflammation and tumour are the greatest, and the blood is to ooze till it drops of itself. This may be repeated freely without danger. But unless there is both an inflammation and swelling, leeches will do no service. The best internal medicines, in a true acute rheumatism, are neutral salts, with very small doses of camphor. The diet must be of the lowest kind. All outward applications are to be omitted as long as any fever or inflammation remains.

The chronic rheumatism is either the remains of a rheumatic fever, or a continuation of pains that proceeded at first from lefser but neglected colds. The blood in this case is fuly. It is an obdinate disease, but bleeding is the most efficacious remedy. Eight ounces of blood is to be taken away once in eight or ten days, as long as it is fuly, or the complaints remain.

Bleeding has been repeated, in many cases, three or four times, to no manner of purpose; nor would the pains abate without deobstructs, diaphoretics, purges, and anodynes. Sometimes they have yielded to the cold bath alone.

Dr Clerk of Edinburgh declares the Arthritis Vaga, or flying gout, erroneously called the Scorbutic Rheumatism, may be often distinguished by the urine of the patient; for certain filaments float in it not so transparent as the urine itself, but when taken out they appear as pellucid as crystal. They will rove to a great length, and when dried turn to a white cafe. This he takes to be the morbid matter of the gout, gravel, gouty sciatica, and all true arthritic pains, distinct from the rhumatism. Soap is the best diffolvent of it yet known, half an ounce of which to an ounce may be taken in a day for a month together, if necessary, in the sciatic and other arthritic pains.

Of the Gout.

The gout is a very painful disease, whose seat is in the joints and ligaments of the bones of the feet; the principal times of its invasion are the spring and the autumn.

In treating of this disease, we shall first give an account of the regular gout, and afterwards of the irregular.

The regular gout usuallly seizes the patient in the latter end of January or the beginning February, in a sudden and without any previous notice, unless the patient has been troubled with crudities of the flomach and indigetion for some weeks before; the body likewise have seemed to have been puffed up with wind, with a kind of heavines, which daily increases, till at length the fit comes on; a few days before which, there is a torpor, and as it were a deacent of wind down the muscles of the thigh, with a kind of epiplectic affection of them. Likewise, the day before the fit, the appetite is more voracious, but not natural.

Though the patient seems to go to bed in good health, yet about two in the morning he is awakened by a pain which most commonly affects the great toe, sometimes the heel, the ankle, or the calf of the leg, which pain resembles that of dislocated bones; there is likewise a sensation as if water almost cold was poured on the membranes of the part affected. Soon after, a shivering and shaking supervene, with a febrifh disorder. The pain which at first is tolerable, becomes more violent in proportion as the
the shaking decreases, and grows more intense every hour till night, and then it is at the height; settling itself about the little bones of the turfo and metatarso rays, whose ligaments it affects. Now there seems to be a violent extension of the ligaments, or there is a sensibility of their being lacerated, or gnawed by a dog. Sometimes they seem to be pressed or squeezed together. At this time the part affected becomes so exceeding sensible, that they cannot bear the weight of the sheet, nor the shaking of the room by a person's walking about.

The patient is now in great torture, and is continually shifting his foot from place to place in hopes of ease. His body likewise is in a constant agitation as the part affected. This always happens at the accession of the fit, but the pain continues without remission till two or three in the morning, that is, twenty-four hours from the first onset, at which time he begins to be at ease, which he is willing to attribute to the last posture in which he placed the affected member. Now he falls into a gentle breathing sweat, and gets a little sleep, and, when he awakes, perceives the part to be swelled, and the pain much abated; for before, the veins of the member, being turgid, were only more conspicuous than usual.

The next day, or perhaps two or three days afterwards, if the gouty matter is copious, the part affected is a little in pain, which grows more violent towards the evening, and abates at the crowing of the cock.

In a few days the other foot begins to be affected in the same manner; and, if the pain has ceased in the first, the weakness which is left behind soon vanishes. The same tragedy is now acted over again. Sometimes, when the gouty matter is in great plenty, it attacks both feet at once, but it generally seizes one after the other.

After both the feet have been tormented, the fits which follow are out of rule, both as to the time of invasion and the duration; only the pain grows more intense at night, and rests in the morning.

From a series of these small fits arises what is called a fit of the gout, which is longer or shorter, according to the patient's age. For it is not to be supposed that, when a patient has been laid up with the gout two or three months, that it is a single fit, but rather a series or chain of small fits, which continually grow shorter and milder, till the peccant matter is at length consumed, and its rage, in two months; but those who are debilitated with age, or the long stay of the disease, it does not leave, still night, and then it is at the height; settling it in the belly, a spontaneous weariness, and sometimes a disposition to fall into a diarrhoea; which symptoms vanish as often as the pain returns to the joints. And thus, the patient being alternately affected with pain and ficknesh, the paroxysm becomes very long and very tedious. This disease seldom invades any patient till he is upwards of thirty, and men are more subject to it than women; as also persons of acute parts, who follow their studies too closely, especially in the night, with an intense application of mind. Likewise those who live high, and indulge their appetites, drinking plenty of rich generous wines; or who use acids too freely, or white easter wines; or who have been addicted too early to venereal pleasures; or whose bodies are large, gros, and full.

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Those also are liable to it, whose sweaty feet are too suddenly chilled; or who suffer their feet to sweat in wet shoes and stockings. Hence hunting and riding in the cold are pernicious. It may likewise be received when the feet are too wet and locked. Hence hunting and riding in a dry, pure, serene air; by friction, and wearing aromatic, antiscorbutic medicines; by alkaline fixed soda, by motion of the affected parts, by going to deep at early hours.

The curative indications require, first, that the prime vice be first free from a load of indigested crudities; and that the visera be restored to their pristine vigour: that by these means the aliments may be duly concocted and assimilated into healthy fluids, and such as will pass freely through the smallest vessels; while whatever is unfit for nourishment may pass off by perpiration, in due time and quantity. Secondly, that the fluid stagnation in, and stultifying up the smallest vessels, may be expelled the body, and a free passage through the contractcd vessels be restored.

The first intention may be answered by vomits and gentle cathartics, repeated as occasion requires; by bitters, aromatics, antiscorbutic medicines; by alkaline fixed soda, taken in small quantities for a long time; by aliments and drinks that are nourishing, light, easy of digestion, quickly assimilated and taken in due quantity; by powerful exercise often repeated and long continued, and especially by riding in a dry, pure, serene air; by friction, by motion of the affected parts, by going to sleep at early hours.

The second intention may be answered partly by the preceding article, as well as by procuring gentle sweats, by bathing in natural and artificial baths; by sweating in a bagno; or by the use of volatile farts, and copious drinking of attenuating liquors actually hot, in the morining while in bed, in order to procure a sweat; as also by mercurial purges, taking a large quantity of di- luents after them; by frictions of the whole body, especially the parts affected, with hot, dry linen cloths, till a redness appear; by cold baths, and the like.

As the proximate cause lies in the vitiated state of the smallest nervous vessels of the body, and of the fluid that passes through them, it is no wonder that bleeding will not reach the matter, state, or cause of the diseafe; yet it may sometimes do good by accident, by causing a small revulsion, and by abating the urgent symptoms.

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As the proximate cause lies in the vitiated state of the smallest nervous vessels of the body, and of the fluid that passes through them, it is no wonder that bleeding will not reach the matter, state, or cause of the diseafe; yet it may sometimes do good by accident, by causing a small revulsion, and by abating the urgent symptoms.

Nor will emetics or cathartics yield so much relief as is commonly thought, because they often raise a disturbance in the nervous fluid, diminish the other fluids, and weaken the expulsive faculty. But much greater benefit may be expected from Tudorifics rightly administered.

Nothing is more fatal than to hinder the gouty matter, now grown mature, and remaining unexpelled, as well as uncorrected by proper medicines, from falling on the usual parts, which indeed cause great pain, but no danger. If it invades the brain, it will occasion apoplexies, palsy, a delirium, weaknesses, dozing, tremors, or universal convulsions: If it attacks the lungs, it produces an asthma, a cough, or a suffocation: if the intercostals and pleura, a convulsive pleurisy; if the abdominal visera, nausea, anxieties, vomiting, belching, piping, or spasms of the visera. It is almost incredible how many diseases it creates, which are suddenly mortal; or at least not to be cured but by reviving the fit of the gout, which had been disturbed, and rendering it as severe as possible.

The last mentioned evils happen from indiscriminate applications of narcotics, refrigerants, astrigents, or in- crassants; or from medicines which cause a revulsion from the diseased part, or from debilitating, evacuating, or suffocating remedies. Hence bleeding, purging upwards or downwards, plasters, poultices, of the nature above-mentioned, and all opiates, produce these effects: as also a spontaneous weakenes brought on by extreme old age; or from the extreme parts being so obstructed, corrupted, withered, or perished, that the morbid matter cannot pass through them any longer.

To abate the excessive pain in the part affected, if there be an absolute necessity, opiates may be given internally, and the patient may drink plentifully of hot whey, or any other liquor of the like nature. External emollients and anodynes may be used laid on pretty hot or the part affected may be beat with nettles, or it may be anointed with terebinthinated balsam of sulphur, or tow may be burnt thereon.

Though there is nothing of any moment to be done in the fit, yet it will be proper to abstain from flesh for some days, and to live upon water gruel, or such like diet; but no longer than the stomach is averse to flesh, for fear of bringing on a disturbance of the animal spirits; but then great care should be taken in the diet, both as to quantity and quality.

As soon as the pain is almost gone, and the swelling and the weakness only remain, nothing can be better than warm stomachic and spicy purges, dosed and repeated according to the strength of the patient. This being premeditated, if the patient's strength is impaired, and his flesh wasted, give after milk with pearl, half a pint or a pint in a morning early, and at five or six o'clock in the afternoon; and to keep up the appetite which the milk commonly palls, and to prevent its cooling effects on the stomach, a light bitter made of gentian, cinnamon, and orange-peel only, the last double to the other two, infused in sherry or white wine, and taken two hours before meals, may be used most conveniently. This course may be continued two or three weeks; after this a course of Bath or German-spa waters with steel, riding, a light white food diet, and generous wine drank temperately, will be most proper.

Out of the fit, those things are most proper which promote the concoction of the aliment, whether by medicines, exercice, or diet.

In the diet there is a medium to be observed; the patient should neither eat more than the stomach will digest, nor be so abstemious as to defraud the parts of such a proportion of aliment as is necessary to maintain the strength and vigour. As to the quality of the food, the patient's palate is to be conformed: but he should dine upon one dish of meat only; for several kinds of flesh, eaten at the same meal, disturb the digestive faculty more than the same quantity of any one sort. As for other things, the
the patient may feed upon what he likes best, provided it is not sharp, nor lashed, nor seasoned with spices. He should eat no supper; but instead thereof should drink a draught of good small-beer, whereby the breeding of the gravel may be prevented. If the patient is troubled with the gravel or stone, and makes bloody water, he may purge with manna once a week, and take a paregoric at night.

The most suitable drink is such as is not so strong as wine, nor so weak as water, for the latter by its coldness will deprave the stomach. Of this sort is the London table beer, or water with a little wine. But, when the gouty matter has seized the whole body, he must abstain from all fermented liquors, though ever so mild and small.

But if the patient has been used to strong or spirituous liquors, or is advanced in years, or through weakness cannot digest his aliment, he may, at meals, indulge himself with a draught of Spanish wine, which is better than French.

If the patient should come upon the gout, which often happens, let the patient omit all other medicines, and drink a large quantity of posset-drink, in which the leaves and roots of mallows and marshmallows have been boiled. Then let a Clyster be given, and afterwards a large dose of laudanum.

When the gout has seized on the head, it is to be treated as any other head-ache, or as an inflammation of the brain and its membrane; bleeding in the arm or jugular, cupping on the back, and blistering between the shoulders, but especially on the ancles, to give the gouty humour a vent downwards. In young and strong constitutions mercurial and antimonial vomits will do wonders. Likewise gentle stomach purges are to be poured down continually, that is, two or three spoonfuls every third hour, till the effect is obtained.

Mercurial vomits are not only proper for the gout in the stomach, but are absolutely necessary as well as mercurial purges, when the gout becomes fixed to, and permanent in a place, as also when it is dispersed all over the habit like a rheumatism. These active medicines must first render the humour fluid, which gum guaiacum, with diaphoreetic antimony, perished in, will afterwards carry off.

Of the Sciatica, or Hip Gout.

The sciatica is a violent and obstinate pain in the hip, chiefly in the joint where the head of the thigh bone is received into the acetabulum of the coxendix. The pain will sometimes extend itself to the lower part of the loins, to the thigh, leg, and even to the extremity of the foot; yet, outwardly, there is no swelling, no inflammation, nor change of colour in the skin.

Sometimes there is such a spasm of the muscles on the side affected, that the patient cannot stand upright, without the utmost pain.

When the sciatica has continued very long, there is such a collection of pituitous humour in the cavity of the joint, that, by relaxing the ligaments, it often causes a luxation. Sometimes it causes an aridura, or wasting away of the adjacent parts.

When the pain leaves the hip, and moves downwards, it is a sign that the spasms are resolved. A violent motion of the body generally exasperates the pain.

After a gentle cathartic, or Clyster, bleeding will be proper, especially in the ancle; also leeches applied to the hemorrhoidal veins have been found beneficial. Strong purges are hurtful, but mercurius dulcis given with scammony, or some other purgative, will be of service.

If the patient is old or weak, lenient purges will be most proper; and on the intermediate days a dose of calomel, which is afterwards to be purged off; and so repeated alternately for some time.

Baglivi observes, that if nothing else will do, in pains of the external parts, recourse must be had to caufies, particularly the leaves of ranunculus, or a mixture of quicklime and soft soap, which are beneficial in the hip-gout.

Cheyne observes, that when the gout is dispersed over the whole habit, or is fixed and settled on a particular joint, mercurial vomits and purges are necessary to dilodge it; but the sciatica will not yield to this, and but rarely to any other method of use; but, by the following method, a perfect cure may always be obtained, if the distemper is a genuine sciatica, though of many years standing.

It consists in taking one, two, or three draams, to half an ounce, according to the strength of the patient's stomach, of the ethereal oil of turpentine; which is that which comes off between the spirit and the oil in drawing off the common oil of turpentine; this is to be taken in triple the quantity of virgin honey, in a morning fasting, for four, five, six, or eight days at farthest, intermitting a day now and then, as the patient's occasions require, or his stomach suffers by it. Large draughts of sack-whey must be drank after it, to settle it on the stomach, or carry it into the blood; likewise every night must be taken a proper dose of Matthew's pills, or half a scruple of the pil. japonaceae, that is, if the oil has been taken in the morning.

To remove the groffer remains and strengthen the weakened part, the patient must take a dram or two drams of flower of brimstone, for some time twice a day, in a tea-cup full of milk. If through great intemperance, or a violent cold, the patient relapses, let him repeat the former medicine for a day or two. Then, to strengthen the prime vue and enliven the spirits, let him drink the Bath or Spaw waters with fleed, and bitters with volatiles.

Of a Virulent Gonorrhoea.

A virulent Gonorrhoea, or Clap, proceeds from impure coition with an infected woman.

This distemper begins and makes its progress in the following manner. The patient, sooner or later, according as the woman with whom he has had conversation was more
more or less infected, and according to his constitution, by which he may be more or less disposed to receive the infection, is first seized with an unusual pain in the genitals, and a kind of sensation like a rotation of his testicles. Afterwards, if the prepuce constantly cover his glans, there appears an eruption or pustule, which by its size, colour, and figure, resembles a spot of the measles; prefently after appears a weeping matter like semen, which daily changes colour, and becomes more purulent and more yellow, till at length, if the disorder be highly virulent, it assumes a greenish hue, or appears like a thin watery fluid. Then it soon proceeds to the glans of the urethra, then to the prostate; which are porous, and afterwards to the vesicles feminales.

If the infected lymph is conveyed to the inguinal glands through the lymphatic vessels, which Cowper discovered to run from the prepuce to the groin; then a venereal bubo is formed, which is a hard tumour without pain. But if the seat of the gonorrhoea is deeper, and an inflammation arises at the beginning of the urethra, where the vesicles feminales discharge the seminal fluid, then these vessels are so compressed by the tumour, that the semen cannot be conveyed to them from the testicles, whence it happens that the testicles swell.

As to the prognostics, we must observe, that the greater the infection is, the more violent and obdurate the disorder will prove; though it seldom brings on a pox unless the discharge is imprudently dropped by the preponderance of the use of abortifics and astringents; for, immediately on the suppression of the discharge, buboes, tumours of the urethra, and other terrible symptoms appear, together with a confirmed fever, the running is small in quantity, the urine is highly fetid, and the matter yellow or green, it is a bad sign.

It is a certain sign the disorder is mitigated, when the painful constriction of the penis in erection, and the heat of urine, are removed; as also when the impaired strength begins to return, and the countenance, which before was pale, assumes a florid or a natural colour.

It is a sign the gonorrhoea is cured, if, upon compressing the penis, a drop or two of thin limpid liquor, like the white of an egg, is discharged.

The regimen, during the time of the cure, requires the patient to abstain from all oily food; and he must also avoid every thing which by its acrimonious quality stimulates to venery; such as spices, bulbous roots, flesh, eggs, fish, and fermented liquors; for the irritation of the penis retards the cure. This is of the utmost consequence; and therefore all venereal incitements, such as obscene books, and whatever else inflames the fancy, should be shunned like death.

Water and whey are the best drink, and seeds and summer-fruits the best aliment.

All possible care must be taken that cold never reach the penis; and that it be kept always moist, lest the pores contracting repel the flux of matter. An emollient and somewhat antiseptic cataplasm will be beneficial.

In the place of mercurials given internally, Afruc di-
medicines the use of crude quicksilver, as in the common usage, to be rubbed upon the parts, as about the body of the penis, especially under the urethra to the perineum, and to up to the tubes and fistulas.

Turner approves of this method in all local affections, such as chancres, a phimosis and paraphimosis from a venereal taint: As also when there is a callousity in the urinary passage, or an induration of the fistulas, particularly their epididymis, left after the hernia humoralis, and the like. Nor does he disapprove of it in common claps during the course of the purgation.

If there is no discharge of virulent matter from the penis, it is called gonorrhoea fica, or a dry clap, the symptoms of which are a difficulty or difficulty of making water, and after, from the increase of the inflammation and tumefaction, an itch or total suppresion of urine.

In the cure of the dry clap, Astruc advises plentiful bleeding in the beginning, to take off the tension, and to abate the inflammation; as also emollient decoctions of mallows, linseed, &c., in milk, to foment the parts; but perhaps it might be better to make a poultice of these ingredients, after Boerhaave's method, to lay to the parts affected; or, which is best of all, to use them one after the other.

He likewise advises lenient elyters, cooling emollients, and ptifans with sal prunella and anodynes between whiles. During the continuance of the inflammation, no mercurials must be used; and if the symptoms increase, threatening an abscess outwardly in the perineum, it is to be forwarded as much as possible by suppressive poultices, and the matter discharged.

Of the Cure of the Symptoms.

I. Of the Hernia Humoralis, or Swelling of the Fistulas.

Astruc, in the cure, recommends frequent bleeding, and an antiphlogistic regimen, and fomenting the parts with a decoction of mallow-roots and linseed; or milk pretty warm; or an anodyne cataplasms of lily-roots, with leaves of henbane, mallows, and brack urine, boiled to a mucilage, and mixed with the flower of linseed and oil of lilies. After the inflammation and fever are abated, he advises a gentle purge; after mild refolvents externally, and antivenereals internally.

The hardness of the epididymis is to be diffused by succinated balsam of sulphur, mercurial plasters, and ointments. During the use of these applications, a suppository bandage should not be neglected.

When pus is formed in the fistulas, it must be discharged with a lancet. If it should leave a fistulous ulcer, he advises a mercurial ointment.

II. Of a Bubo.

Astruc afferts, that venereal buboes are of two kinds: the first is essential, happening immediately after coition with an infected person; the second symtomatical, which follows the suppresion of the gonorrhoea, or the drying up of the ulceration. He likewise mentions a third, which does not appear so early as the other two, and is therefore a pathognomonic sign of a lues venerea or pox.

He proposes to cure it by mercurial purges, to carry off the humour; in the mean time rubbing a mercurial ointment into the part, to dissolve the induration; which he thinks is more gentle and easy, than to promote the suppuration by ripening poultices, and then opening the tumour by a cautie, giving mercurials inwardly at the same time.

De Salt cures all the symptoms by rubbing into the parts a strong mercurial ointment, causing the patient to anoint himself from the anus all along the urethra to the glans and prepuce. The following day he gives a strong dose of jalap, that is, from two scrupules to a dram. His diet drink is to be spring-water in which mercury revived from cinnabar has been boiled. If the patient cannot bear much purging, he may have a truce for a day or two, but the ointment is to be continued every night. The first friction gives considerable relief, the second yet more, the third commonly makes the pain cease, and the fourth and fifth generally silence the complaints. Five or six weeks generally perfects the cure.

In buboes, the patient is to rub the ointment into the groin, scrotum, and parts in either sex; purging every day, and drinking the mercurial water; by which means the buboes melt away, the phimosis, paraphimosis, and chancres disappear, and the former health returns. If there is matter already formed in the bubo, then he allows it must be opened. Heiffer's method is much the same.

III. Of Caruncles and Carnosities in the Urethra.

The obstacles which hinder the free passage of the urine, according to Astruc, are these which follow. 1. Ulcers in the urethra. 2. Cicatrices left behind after the healing these ulcers. 3. Caruncles. 4. A chirrhous on the verumontanum, or caput gallinaginis. 5. Indurations of the prostate and vesiculae seminales. 6. Carnosities rising in and straitening the canal.

He proposes to cure the ulcers by the same regimen as the first period of a gonorrhoea, viz. by repeated bleedings, lenients and refrigerants, to abate the fluxion, and take off the inflammation.

Turner, in the worst cases, would not have the urethra laid open, but only have the perineum well greased with the mercurial liniment, by which he has known many large callousities insensibly dissolve, while the candle or leaden probe, smeared also therewith, has been kept within.

But there has been lately introduced into practice by Daran a new method of curing these disorders with bougies, the composition of which he keeps a secret.

According to him, if the canal of the urethra be open enough to admit the extremity of the bougie, a suppuration will ensue from the divided part of the urethra, which will in time relax and open the stricture; or, if the stricture opposes the entrance of the bougie, yet still the mere point of the bougie will suppurate it in a small degree, and by and by, though much more tediously than in the other case, by relaxing, open it.

The first discharge procured by a bougie is generally very foamy, and evidently flows from the place where the obstruction is, that part of the bougie only being covered.
covered with matter that answers to the obstruction. Again, the cordex, excited by the use of the bougie, is infinitely more painful where the obstruction is, than in the other parts of the penis. It will, it must be owned, produce a cordex in a found penis; but then it extends through every part of it, and is by no means so painful as the other.

If the symptoms of the strictures, callous scars, caruncles and tumours of the corpus spongiosum urethrae are essentially different, those differences are not mentioned by any writer; except that, when the urethra only is affected, the patient, in making water, voids matter before his urine; but when the prostate glands or vesicular females only are concerned, matter follows the last drop of urine. But it frequently happens that one is complicated with the other.

The properties requisite in a bougie, are a sufficient degree of firmness, that it may be introduced with some force: A suppleness and tenacity, that it may conform to the motions of the body without breaking: A lenient suppurative disposition, to bring on a discharge without pain: And, lastly, a smoothness of surface, that it may not only be introduced with more ease, but that it may lie easy in the passage till it begins to disfigure.

That chiefly made use of is as follows;

Emplast. commun. emu pice Burgund. 3ij. Argent. viv. 3ij. Antimon. crud. pulv. 3ij. M.

The emplast. com. or diachylon, must be made with oil and a little Burgundy pitch added to it, to render it sufficiently tenacious: the antimonymust be finely levigated, that it may give a smoothness and good confidence to the bougie.

The quicksilver, whether it be divided in half sulph. or honey, must not be put into the plaster till the moment before the bougies are made, nor must the plaster be boiling hot at that time. When the quicksilver is mingled with the plaster moderately hot, slips of fine rag must be ready to dip in the composition. They must be of different lengths, from five to nine or ten inches, and about three inches broad. Roll them up loosely, and, taking hold of one extremity with the left hand, let it fall gently on the surface of the plaster, and then draw it out gently. As it is drawn out, it will unroll, and take up a quantity of the plaster upon its surface, equal to the thickness of a silver groat. It may be proper to affist the unrolling with a spatula. The plaster must be hot enough to soak through the quicksilver; it is also exceedingly desirable that it enter within the obstruction. However, it is necessary to desist from pushing it when once it begins to bend. When it meets with any resistance, to avoid the bending, turn it round with your finger and thumb several times, and, as you turn it, press it a little forwards. If by this method it advances, continue to do the same thing till it stops. But it must be owned that the operator in this case may be easily deceived.

Two bougies in a day generally answer the purpose; one in the morning, and one in the evening, as more suitable to the patient's avocation; though some can walk about with them.

If the testicles should inflame, or any feverish disorder come on, they may be kept in an hour, or half an hour in a day, to prevent the urethra from contracting again till the symptom is removed; to prevent these disorders, the patient should observe a cooling regimen during the treatment.

Some are relieved by the bougie in a few weeks, some not till many months. Generally the cure may be performed in seven, eight, nine, or ten weeks. This is known by the removal of every symptom of the disorder; for some degree of running will generally continue as long as the bougie is employed.

When the patient judges himself well, it will be best to desist gradually, wearing it at first only an hour or two in a day, and then two or three times a week, after which it may be entirely left off. If any gleet still remain, or any obstruction threatens to return, it will be necessary to use the bougie four or five weeks longer.

In suppurations of urine it will be always advisable to introduce the catheter if possible, and indeed to keep it in
in the bladder two or three or four days; after which, the canal will perhaps admit a bougie, and then, a suppu-
ration being once procured, it may easily be preferred open.

IV. Of a Gleet.

In what manner, says S H A R P , a gleet is furnished, cannot well be determined, without first ascertaining the ex-
aot fear of a gonorrhoea. That the lacunae of the ure-
ithra are usually ulcerated in a gonorrhoea, is now generally
affected to. Yet though all allow the existence of ulcers
during that disease, they will not admit that a gleet is the
discharge of an ulcer.

But it is most probable, that the running is not all of it a purulent matter, but partly a discharge from the secre-
tory organs, as also from the vesica feminales, when they or their ducts are affect-
ed. For the running is produced in few time after the
infection than is requisite for the formation of matter
in every other instance; and the appearance of matter is
frequently the first alarm in a gonorrhoea, the beat of
urine and other symptoms of an inflammation and ulcera-
tion following sometimes two or three days after.

For these reasons, it is supposed, that the venereal poifon,
in its first operation, irritates only, and thereby increas-
the fecretion; especially as the fame thing happens to the
glans and preputium of men, as well as the labia and
parts with cinnabar fucceful in chancrous ulcerations on

A temporary increafe of a gleet is not wonderful, becaufe
habitual ulcers of every other part of the body are often
in a fluctuating state, and generally suffer from exccfes of
every kind.

A l t r u c , in this disorder, recommends milk, either of
affes, goats, or cows, to be drank morning and evening
for some time; then mineral waters, whether chalybeate
or vitriolic, for 15 or 20 days; and afterwards balsamics,
to deterge and cicatrife the ulcers concealed in the urethra,
such as hulfam of capivi, from 6 to 12 drops, made into
a bolus with powder-fugar; lafit of all, astringents to dry
up the ulcers, and to recover the loft tone of the parts,
such as infusions of the leaves of mint, horehound, agri-
mony, plantain, red roifes, shepherd’s purfe, fage, &c.
or the mint-water of Quercetan, fo often recommended
by R iversius againft obdinate gleets.

V. Of Chancres.

A s t r u c obferves, that chancres were the caries puden-
dorum of the ancient writers, and are generally feated
on the dorfun penis, as well as on the pubes and inside of
the glans and preputium of men, as well as the labia and

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A temporary increaf
the same nature; and even extends them to their nipples, where the ulceration constricting the area or circle round about them irritates the same. The phimosis of women is the contraction of the entrance into the vagina.

He begins the cure with bleeding and gentle purgatives, such as 

\[ \textit{effaia cum manna} \text{ and } \textit{merc. dale.} \] instead of brisk cathartics and emetics, which, as Turner thinks, by making a stronger revulsion, afford speedier relief.

He then advises anodyne emollient fomentations and cataplasms to relax and soften, and afterwards insufficient to breathe forth the humours; and, if the penis is foaked therein an hour or two twice a day, the effect will be more certain; but if a flagration is threatened, and thence a gangrene, the prepuce is to be divided in the phimosis on each side the glans, and the folds of it to be cut through in the paraphimosis; by which the strangled glass may be set free, and the chance, it any, brought into view. The like must be done for the crysalline, in order to discharge the imprisoned lymph, and forward the subsidence of the prepuce, thereby inflating and puffed up.

The affected parts in women should likewise be fomented with the like emollient and mucilaginous decoctions, of the roots of marsh mallows, white-lily, water lily, and the leaves of branc urfine, mallows, linseed, &c. several times a day. Afterwards, a peffary made of linen or sponge dipped in the emollient liquor should be introduced into the vagina.

VII. Of Tubercles and Scirrhous Cords.

The tubercle is a callosity remaining after healing the chancres of the glans, which hinders the free play of the foreskin over the glans. If this will not yield to a strong mercurial unction, the only remedy is circumcision.

The scirrhous cords are tubercles which arise where there has been an ulceration; and may be left under the skin of the penis, sometimes round, and sometimes like a cord. They arise gradually, and disappear with the help of a little mercurial unction, and a course of mercurial purging, unless complicated with other symptoms of a worse kind.

VIII. Of the Porri, Condylomata, Chrifte, and the like Excrefences.

The venereal porri, whose seat is the pudenda, if they are recent, small, and soft, sometimes dry and fall off of themselves, after the poison has been destroyed by mercurial fridions; but if they are hard, large, and have deep roots, they will sometimes continue after them, and grow like warts in other parts of the body. In this case they must be cut with the point of the fciﬀars as near the skin as possible, and a mercurial platter must be prepared with a large proportion of mercury, and mixed with 

\[ \textit{disch. cum gum.} \] to promote a suppuration, and to dissolve the calloﬁties at the bafes of the porri, before a cicatrix is formed.

But if the bafis is hard, and surrounded with hard and deep calloﬁties, flight mercurial fridions must be used; and the wound must be dredis with basilicon, sprinkled with red precipitate, to consume the calloﬁties by little and little, to soften the edges of the ulcers and dispose them to heal. If this should fail, stronger corrosives should be used.

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The same directions are applicable to the whole tribe of condylomata, chrifte, mora, fci, either about the pudenda or anus.

Of the Lues Venerea, or French Pox.

When a gonorrhoea has continued a long while, or long enough for the poisonous matter to make its way into the blood, or, by affringents given uneafonably, it cannot make its exit, then the patient is infected with the pox.

The buboes in the groin constitute the first degree; then follow pains which cruelly torment the head and joints of the shoulders, arms, and ankles, coming on by fits, but at no certain intervals, unless in the night when the patient is warm in his bed, feldom leaving him till towards the morning.

There are also scars and fcurv in various parts of the body, which are as yellow as a honey-comb, and which disinguishes them from all others. Sometimes they have large surfaces, anfwering the description which authors give of the leprosy. But the more these scars are dispersed over the body, the lefs he is tormentcd.

All these symptoms gradually increase, especially the pain; which becomes fo intense, that the patient is unable to lie in bed. Afterwards nodes or exoftoses arise in the skull, shin-bones, and bones of the arms, which, being attended with conflant pain and inflammation, at length grow curious and putrefied.

Phagedenic ulcers likewise fize various parts of the body; but generally first begin with the throat, and from thence gradually creep by the palate to the cartilage of the nofe, which they deftroy, and the nofe, being deftitute of its prop, falls down flat.

The ulcers and pain daily increafing, the patient finks under the torment; and being not able any longer to struggle with ftech, rottenefs, and the flos of one member after another, his mangled offensive carcafe is hurried into the grave.

Besides the symptoms proper to the pudenda and parts adjacent, which have been already mentioned, the following are obfervable in a confirmed pox; which however do not appear in all patients, nor at the fame time.

1. The skin, especially about the neck and breath, and between the shoulders, is covered with flat spots like freckles, of a rofy, purple, yellow, or livid colour, sometimes fいるとc, small and round like lentils, sometimes more large and extended.

It is full of itchty pufcles, tettets, and ringworms, a fterpigo, a herpes miliaris, and exedens. There are chaps in the palms of the hands and foles of the feet, with itching, from whence proceeds a clear frous liquor, and the epidermis peels off in large flakes.

It abounds with hard, callous, round pufcles, rising a little on the top, generally dry, but sometimes moist, foally, brauny, and yellow; frequently on the corns of the lips, and the fides of the noftrils, but more especifally on the forehead, temples, and behind the ears, where they appear in rows like a string of beads, and gradually creep along the hair.

The hair not only falls off from the head, but all parts of the body where it grows. Then the nails become un-

L 1 2 equal,
equal, thick, wrinkled, and rough; afterwards ulcers arise which cause them to fall off.

II. The inside of the mouth, throat, and nose, are also affected; the uvula and tonsils become painful, hot, inflamed, and ulcerated; phlegmonous ulcers, which rot the bone as far as the nostrils. The pituitary membrane is likewise liable to pustules, which produce malignant ulcerations that infect the bones of the nose with a caries, particularly the vomer; which being eaten away, the nose falls down; the voice becomes hoarse and low; the gums being covered with aphthae, ulcerate and rot; the teeth ache, grow rotten, and fall out; and the breath is very offensive.

III. The patient is excruciated with pains in the nighttime, when in bed and covered with cloaths; these are either tenfive, prickling, pulsative, or rending; fixed or wandering; which sometimes occupy the muscular and membranous parts like the rheumatism, sometimes the tendons and ligaments about the joints resembling the gout; sometimes they are with tumour or inflammation, sometimes without.

IV. The bones are affected in various manners; in the middle exostoses arise, either soft or hard, sometimes with intense pain, sometimes without. The heads of the bones enlarge every way, but unequally, which produces tumours, pains, difficulty of motion, and stiff joints. As the caries increase, they become brittle, and break upon the least effort. Sometimes they are so far dissolved, as to bend like soft wax.

V. When the lymph is infected, the lymphatic or conglobate glands become hard and callous, and form, in the neck, armpits, groin, and mufeteriy, hard, moveable, circumscribed tumours, like the king’s evil. The lymphatic vessels are dilated, extended, and enlarged by a thick flaginating lymph, and form soft encifled tumours or gummata: in the tendons it causes nodes, in the nerves gangions, and in the ligaments of the joints topha.

VI. Neither do the ears and eyes escape the fury of this disease: for the latter are externally affected with pain, redness, itching, and lippitude; and internally, being loaded with humours, the sight is destroyed, and sometimes a suppuration supervenes. If the vitreous humour of the eyes is thickened, it causes a glaucoma; if the crytalline, a cataract; if the aqueous, hairs or spiders webs.

The methods of curing the pox are principally four: 1. The common, by salivation; 2. By giving quicksilver pills; 3. By mercurial frictions, which are to be purged off before a salivation is raised; 4. By sweating, with a decoction of guaiacum.

The safest and most commodious method of salivation is by mercurus dulcis six times sublimed, given inwardly in the milder pox; or by mercurial union, when the disease is got into the bones.

Fifteen grains of mercurius dulcis may be given in a morning, and the like dose at night, with eleffiar, e foerdis. After three, four, or five days with this management, we usually observe the sauces to inflame; the inside of the cheeks to be tumid, or high and thick, being ready to fall within the teeth, upon flushing the mouth; the tongue looks white and foul, the gums stand out, the breath flinks; and the whole inside of the mouth appears shining, as if parboiled, and lying in furrows.

The inside of the mouth thus beginning to be whealed, you may expect soon to see them ulcerated, especially about the salival glands, which empty themselves thereinto. Now it may be proper to desist a day or two, to observe the increase of the ulcers, what floughs are like to be raised, and what their depth and dimensions are like to prove; from which a near conjecture may be made of the duration as well as quantity of the spitting now begun, and the confidence of the draining lympha whether more or less fluid.

When the salivation is thus begun, your only busines is to encourage your patient cheerfully to go on. Let his diet be small chicken-broth, water gruel, and panada. His drink, small fack-whey, or posset-drink, with a draught of good small-beer with a toast between whiles.

Thus, after some days reprieve, if, after the spitting comes on, you find the patient hearty, his chaps but little swelled on the outside, and as little sore within, the ulcers not increasing, with few or no floughs appearing therein, the flux also inconsiderable in quantity, you may now give a scruple of merc. dulcis. in eleff. e foerd. at going to rest, repeating it two or three days following, as you find occasion, and then wait the issue again. This is the safest and most prudent method.

If he should have taken half an ounce of calomel, with little alteration as to the swelling and foreness of his mouth, and as little appearance of his flavoring, his pulse and other circumstances favouring the same, and no ill symptom appearing, you may vomit him with viij or x grains of turpeth pills; 3. By mercurial frictions, which are to be purged off before a salivation is raised; 4. By sweating, with a decoction of guaiacum.

When the spitting goes well forward, it may be left to take its course till it declines of itself; which, in proportion
portion to the ulcers and thickens of the sloughs about
the parts of the mouth, may happen at the end of twenty-
one days, or a month from its rising; that is, from the
time of spitting a pint and a half a day, till it comes to
three pints, or even five pints, in twenty-four hours, when
it gradually goes off again. For often the first four or
days, or a week, are spent in bringing it to the first
proportion.

In the more stubborn and rebellious pox, attended not
only with cruel night pains, gummata, tophs, nodes, and
also rotten or foul bones, if the patient has been used to
mercurials, or if salivated before, then the cure must be
attempted with salivation by union.

You may mix an ounce of quicksilver with three ounces
of azuniga; of which, an eighth part is to be used night
and morning, letting the patient rub it in with his
own hands gently by the fire, beginning with his ankles
up to his shins and knees, all round his joints, and so to
his thighs, which are presently after to be covered with
yarn flannels and flannel drawers; then let him use
what remains of his eighth part about his elbows and
shoulders, wiping his hands clean about the glands of his
arm-pits, or those of his groin. His body, during the
unions, should be screened from the cold with a blanket
hung behind him, and then be wrapped up in a warm flan-
et; that is, he must have a flannel shirt, waistcoat and
drawers, a cap, a muffler pinning it up thereto behind, and
covering all his throat, chin, and cheeks before, to de-
defend them from the cold air. The same things are re-
quited in the former way. The weak need only be a-
pointed once a day.

If, when the ointment is divided into four parts, after
the third union the patient begins to complain of his
chaps, you must flay a day or two before you proceed
farther: The same when gripes or bloody stools approach.

Where there are a gummata, tophs, and nodes, the
ointment must be chafed particularly into those parts, and
then apply the mercurial plaster upon them. If the spitting
deares too suddenly, give a scruple of calomel e-
every day, or every other day, for two or three times, as
you shall see occasion.

When he is a little recovered, and his chaps pretty well,
he may eat a little chicken, veal, rabbit, or mutton, well
roasted, without sauce or gravy.

The patient should be prepared for a salivation by a
leisure purge or two; and, if plethoric, he should bleed:
Likewise bathing in warm water, for some hot, lean, ex-
emaciated people, has been found serviceable. Women
should be laid down just after their menstrual flux is over.
Temperate weather is the most suitable.

If the patient is troubled with falls, knees, and vomiting;
if mild, give him freely of a small chicken-broth, posset-
drink, or thin water-gruel, refreshing him with a little
mulled wine between whiles. But if there is a cardialgia,
and intolerable pains at the mouth of the stomach, with
incessant vomiting, spafs of the members, fainting, cold
sweats of the forehead and eyebrows, the patient is in
the utmost danger, and you must cease giving mercury,
and if possible turn it downwards, by directing the com-
mon clyster with 2 or 3 ounces of brown sugar, and as
much oil-olive.

To prevent the jaws from being locked up, it is ne-
extecessary to use a bit of stick covered with a soft rag, which
must be held between his backward teeth; But, if there
should happen an adhesion of the inside of the cheek to
the gum, hindering the patient from eating and opening
his mouth, the same is to be carefully divided.

If, during the salivation, a blood-veil bursts open,
make a little pellet of lint, and cover it with the fine pow-
ders of alum or vitriol, or dip it in the tinctura flyptica,
and thrust it close down into the cavity, which will se-
cure the effusion, being held tight with the finger for a
little while. If it happens from the separation of the
sloughs from the sides of the cheeks, a little oxycrate held
in the mouth will do the business, or an altringent deco-
cration of oak bark.

If the patient has been without a stool for some days,
give an emollient clyster of warm milk, sugar, and oil.
At this time he may drink freely of small beer with a
toast, barley water, small sack-whey, or posset-drink.
For diet, water-gruel, oatmeal-curd, small chicken or
veal broth, a roasted pippin, or a few stewed prunes.

If, notwithstanding your care in giving small doses of
mercury, the sauces should suddenly inflame and tumefy,
endangering a suffocation of the patient, the most certain
relief is to bring the humours downward by sharp cry-
flers, and, if he can swallow it, a cathartic by the mouth.

An ozana, or ulcer of the nostril, is best cured by a
acinabarine fumigation, which subdues the malignity,
dries up the ulceration, and dispels the caries, if any,
to a separation beyond all others. after which, and some-
times before, calomel must be given and purged off; or,
if there are other symptoms of a profound infection, you
must salivate by union.

The like method must be used for ulcers of the palate,
uvula, and tonsils. The same rarely fails to stop the far-
ther erosion, and therefore it is always to be directed,
though a salivation is intended. It cures, in two or three
days time, the most putrid and corrosive venereal ulcers,
or after the second or third smoking.

Afluce disapproves of any other method of salivation
but by frictions; and he would have pure mercury ground
in a mortar, with just so much turpentine as will reduce
it into a brown or black powder, and mix with it equal
parts of fresh lard, and so well mixt, that the particles of
the mercury shall not be visible by a magnifying glafs.
He also allows that occasionally there may be double the
quantity of lard.

He distinguishes the frictions into weak and strong;
for the strong he allows not less than two drams of the
ointment, nor more than four. The first time, the patient
is to be anointed from the feet to the calves of the legs;
two days after, from thence to the middle of the thigh;
then the third time, as far as the buttocks. If after the
seventh day there appears no sign of a salivation, you must
proceed to the fourth friction, from the buttocks along
the loins and back to the neck, with a large quantity of
ointment. If on the ninth day nothing appears, anoth-
er friction must be from the wrists to the shoulders.

During the salivation, he allows the patient, if he has
strength, to get up sometimes, and sit by the fire; or, if
he cannot, to sit up in bed: when he lies down, he would
have
have him lie in as prone a posture as he can, that the saliva may be evacuated more easily, and not fall into his stomach.

In the weak or slight friction he allows from one to two ounces of the ointment. The first friction is to be only on the feet; the second on the legs; the third on the knees; the fourth on the thighs; the fifth on the buttocks and perineum; the sixth on the loins; the seventh on the back and between the shoulders; the eighth and ninth, if there is occasion, from the arms to the wrists. There may be three, four, five, or even six or seven days between each friction, if the patient is very weak: But the rule is, to look into the patient's mouth before a new friction, that you may be certain not to bring on too plentiful a salivation. The dose of the ointment must be so managed, that, after the fourth or fifth friction, a salivation may come on that is gentle, easy, governable, without a swelling of the head; with only a few aphthae in the mouth, or at most a few superficial ulcers, and the patient not spitting above a pint or two in twenty-four hours: and to this point it must be kept up, with a new friction, if there be occasion. Likewise it may be kept under with clysters and plentiful drinking of the pilian; and, if necessary, with lenitive purges. This treatment may be continued, pro re nata, from 30 to 50 days, or longer.

Till the salivation comes on, the patient may be indulged in weak soups, rice, cream, panada's &c. and even milk for breakfast; but after that they must be left off; and he must drink a large quantity of pilian to dilute the blood. He may sit up all day, if his room be warm.

If, after a due repetition of mercurial frictions, a salivation does not appear, it generally happens that a looseness, a flux of urine, copious sweats, or at least a plentiful transpiration, will supply that defect, and serve in its stead. In this case, the patient may think himself exceeding happy and fortunate, that he has obtained a complete cure by a method more certain and convenient than by salivation, and without its inconveniences and dangers.

The second method of curing the pox is by a quicksilver pill. This was brought into reputation by Bellode; and though he has kept the composition a secret, yet there is no reason to doubt but it is quicksilver mixed with a certain proportion of a cathartic.

The third method of curing the pox is by mercurial frictions, which De Salt gives as follows:

When the patients have a pox of a long continuance, and the venereal poison is dispersed all over the body, they should be prepared by bathing and drinking whey. But in a recent pox the bath is not necessary, or at least need not be used long, because the blood is sufficiently diluted.

After this, instead of raising a salivation, bring on a flux of the belly; the whole secret of which consists in keeping the body open by clysters of a decoction of fenna and the pulp of calia, before the frictions are administered; by which the intestinal glands being opened, the mercury will more readily tend that way. When the looseness does not answer the number of the frictions, nor the quantity of the mercury made use of, purge the patient with powder of jalap, and procure copious fluids, which secure the mouth. While the looseness is going on, the friction does the office of a purge; and in proportion as they are repeated, the flux of the belly revives; and when it slackens or stops, have recourse to the clysters and purges of jalap. Pursue this method till the symptoms cease, and till, by the abundance of the evacuations, the venereal poison is entirely drained off.

The last method is sweating with strong decoctions of guaiacum. This we have the first account of from Sir Ulrick Hutton, who purified it himself. A pound of guaiacum is to be boiled in a gallon of spring-water to one half, and theicum referred to anoint the fores, and a secondary decoction was to be used for common drink.

But, when salivations and other mercurial courses have failed, the best method of cure is by the root of farfaparilla; which discovery we owe to Dr Hunter, who put Mr Fordyce, a surgeon in the army, upon making a trial of it; the result of whose experience is as follows.

1. It will commonly relieve venereal head-aches and nocturnal pains in a very short time; and, if persevered in, he believes it will always cure.

2. In emaciated and consumptive habits, from a venereal caufe, it is the greatest restorer of the appetite, flesh, colour, strength, and vigour, that he knows.

3. When the throat, nose, palate, or the fquinty bones in general, are affected with a Fluent or cares, it will commonly complete the cure, if persevered in long enough, provided a mercurial course by undtion has preceded the use of the farfaparilla.

4. When the body is covered with dry blotches or moist sores from a venereal caufe, it will greatly promote the cure, nay often complete it; but, without the assistance of mercury, there will be danger of a relapse.

5. In simple chancres it will do little service; but, if it is given in cases where the chancres or bubbles will not heal or dissolve after the use of the mercurial undtion, it will often cure, and do always manifest service.

6. It will often answer, and that speedily, without sweating, confinement, or any strict regimen, at all seasons of the year, when mercurial undtions and long continued courses of strong decoctions of guaiacum, either by itself simply, or compounded with a small proportion of farfaparilla, have failed.

7. It seems probable, that farfaparilla root is the only medicine to be depended upon in venereal cases where mercury has failed, or at least has preceded the use of the decoction; for it is not to be trusted alone. When no mercury has been given, it and this decoction may be administered together, and then there will be no room to doubt of success.

8. Mercury alone will cure most venereal complaints, and farfaparilla will perhaps always cure them when they reft the power of mercury; and therefore a proper combination of mercury and farfaparilla will probably cure every caufe that is truly venereal.

The method of using it is this; to three ounces of the farfaparilla root, which has not been spoiled with age, worms, sea-water, or moisture, add three quarts of river-water, and make it boil as speedily as possible, in an open vessel, till two pints of the strained liquor remain, that is, about two pounds avoidupoife weight; a little liquorice-
The yaws are not dangerous, if the cure is skillfully managed at a proper time; but if the patient has been once salivated, or has taken any quantity of mercury, and his skin once cleared thereby, the cure will be very difficult, if not impracticable.

The negroes who have been cured in Africa never have them again in America.

As soon as the yaws begin to appear on a negro, he must be removed to a house by himself; or, if it is not certain whether the eruption is the yaws or not, shut him up seven days, and look on him again, as the Jews were commanded to do with their lepers, and in that time you may be commonly certain.

As soon as you are convinced that it is the yaws, take a scruple of flowers of sulphur; five grains of camphorated spirit of wine; a dram of Andromachus's treacle; and a sufficient quantity of syrup of faffron. Make them into a bolus, to be taken at bed-time.

Repeat this bolus every night for a fortnight or three weeks, or till the yaws come to the height; that is, when they neither increase in size or number. Then throw your patient into a gentle salivation with calomel given in small doses, without farther preparation; five grains repeated once, twice, or thrice a-day, is sufficient, as the patient can bear it.

If he spits a quart in twenty-four hours, it is enough. Generally, when the salivation is at this height, all the yaws are covered with a dry scaly crust, or scab; which, if numerous, look terribly. Thefe fall off daily, or in clusters of a few, and in ten or twelve days leave the skin smooth and clean. Then the calomel may be omitted, and the salivation permitted to go off of itself. A dram of corrosive sublimate dissolved in an ounce of rum or brandy, and the solution daubed on the yaws, will clear the skin in two days time. After the salivation, sweat the patient twice or thrice.

He may like ineffer drink the decoction of guaiacum and sassafras fermented with molasses, for his constant drink.

Sometimes there remains one large yaw, high and knobbed, red and moist; this is called the matter-yaw. This must be consumed an eighth or a tenth part of an inch below the skin, with equal parts of corrosive mercury and burnt alun, and digested with an ounce of yellow balsam and a dram of corrosive mercury, and cicatrized with lint pressed out of spirits of wine, and with the vitriol fome.

To children under fix or seven years old, at the proper time of salivating, [when the yaws are come to their full growth,] give a grain or two of calomel in white sugar, once a-day, one in two days, or once in three days, so as only to keep their mouths a little fop till the yaws dry, and, falling off in white scales, leave the skin clean. This succeeds always, but requires a longer time than in adults.

The venereal disease and the yaws feem to be very different distempers; but the symptoms, in conquence of the yaws ill cured, coincide fo exactly with the symptoms of an invertebrate French pox, that in molt cafes it will be very difficult if not impoflible to diflinguish them.

Of the SCROPHULA, or King's Evil.

The King's evil is attended with hard, feirrhous, and emaciated parts, anus, arm-pits, and face. They are large when fewed in number, and vice versâ. They are not painful to the touch, yet so much resemble. In the mean time, the black hair in the yaws turn to a transparent white.

It is not an easy matter to determine the exact time which the yaws take in going through their different stadia. Lufly well-fed negroes have had several yaws as an infeffious disease.

The operation was either by sweat or urine, efpecially when the medicine proved most effective. It was continued as long as any of the symptoms remained, with a low, spare diet, plenty of barley-water, and a little milk, or fome fuch diluting liquor.

Of the YAWS.

The YAWS is a distemper endemical to Guinea and the hotter climates in Africa; but has of late spread by infection over many parts of Europe. All are liable to it, but more especially in childhood or youth.

It makes its firft appearance in little spots on the cuticle, not bigger than a pin's point, which increafe daily, and become protuberant like pimples. Soon after, the cuticle frets off; and then, instead of pus or ichor, there appear white floughs or fordes, under which is a small red fungus. These increafe gradually, fome to the fize of a small wood-strawberry, others to that of a rafberry, red fungus. Thefe increafe gradually, fome to the fize of a small wood-strawberry, others to that of a rafberry, red fungus. Thefe increafe gradually, fome to the fize of a small wood-strawberry, others to that of a rafberry, red fungus. Thefe increafe gradually, fome to the fize of a small wood-strawberry, others to that of a rafberry, red fungus. Thefe increafe gradually, fome to the fize of a small wood-strawberry, others to that of a rafberry, red fungus. Thefe increafe gradually, fome to the fize of a small wood-strawberry, others to that of a rafberry, red fungus. Thefe increafe gradually, fome to the fize of a small wood-strawberry, others to that of a rafberry, red fungus. Thefe increafe gradually, fome to the fize of a small wood-strawberry, others to that of a rafberry, red fungus. Thefe increafe gradually, fome to the fize of a small wood-strawberry, others to that of a rafberry, red fungus. Thefe increafe gradually, fome to the fize of a small wood-strawberry, others to that of a rafberry, red fungus. Thefe increafe gradually, fome to the fize of a small wood-strawberry, others to that of a rafberry, red fungus. Thefe increafe gradually, fome to the fize of a small wood-strawberry, others to that of a rafberry, red fungus. Thefe increafe gradually, fome to the fize of a small wood-strawberry, others to that of a rafberry, red fungus. Thefe increafe gradually, fome to the fize of a small wood-strawberry, others to that of a rafberry, red fungus. Thefe increafe gradually, fome to the fize of a small wood-strawberry, others to that of a rafberry, red fungus. Thefe increafe gradually, fome to the fize of a small wood-strawberry, others to that of a rafberry, red fungus. Thefe increafe gradually, fome to the fize of a small wood-strawberry, others to that of a rafberry, red fungus. Thefe increafe gradually, fome to the fize of a small wood-strawberry, others to that of a rafberry, red fungus. Thefe increafe gradually, fome to the fize of a small wood-strawberry, others to that of a rafberry, red fungus. Thefe increafe gradually, fome to the fize of a small wood-strawberry, others to that of a rafberry, red fungus. Thefe increafe gradually, fome to the fize of a small wood-strawberry, others to that of a rafberry, red fungus. Thefe increafe gradually, fome to the fize of a small wood-strawberry, others to that of a rafberry, red fungus. Thefe increafe gradually, fome to the fize of a small wood-strawberry, others to that of a rafberry, red fungus. Thefe increaf...
often indolent tumours, which arise by degrees in the
 glands of the neck, under the chin, armpits, groin, hams,
 arms, and wrists; but it is most commonly feated in the
 neck, and beneath the ears.

Likewise cold tumours, which appear on the joints and
 bones, as on the knees, elbows, hands, and feet, but
 more particularly on the fingers, are disorders of the scro-
 phulous kind: as also the great part of those indolent
 fluxions, which fall gradually on the joints, without a
 manifest caufe; and which are attended with an abfece,
 a caries, and swelling of the bones, called the *sina vento-
 fa*; especially of the apophyses and epiphyises. Of the
 glands of the neck, under the chin, armpits, groin, hams,
 the joints. They consist of a jelly or coagulated lymph,
 whence the forerunners of this disease, antecedent to the great
 fluxions which arise in the arms, legs, and feet, principally about
 the joints. They confist of a jelly or coagulated lymph,
 which puff them up, but do not put when prefixed
 with the fingers like dropfical swellings.

In the eyes the scrophulae create inflammations; in
 the eye-lids a pufing up of their edges with great forenens
 and small ulcers; in the angles of the eye a fistula la-
 chrymala, by ulcerating the gland planted there for the
 percolation of tears; in the lips, excessive and preterna-
tural thickness; in the nose it often creates the crufly ul-
car called ozana. All which, except the last, are often
 the forerunners of this disease, antecedent to the great
 swellings and foul ulcers which appear in its mature state.

The glands of the external parts are not alone attacked
 with this disease; for those of the mefentery are almost
 always affected; which appears from the opening of per-
 sons dying of this disease. Sometimes the disease begins
 in the mefentery: and sometimes the liver, spleen, womb,
 lungs, windpipe, brain, and other internal parts, are scro-
 phulous: Hence scirrhous tumours, incurable cancers, ob-
 linate fluxions, rebellious ophthalmies, malignant abcofe-
 s, fistulous ulcers, dangerous quinsies, terrible epilep-
ties, mortal consumptions of the lungs, stubborn jaundices,
 dropfies, cholics, hypochondriac and hysterical affections.

The scrophulae are hard tumours, because they are pro-
 duced by a thick coagulated matter; they are cold, be-
 cause they are caused by a flagellation of the lymph in the
 part affected.

The scrophula may be said to be benign, when they are
 superficial; when they do not much raise the skin, nor
 change its colour; when only the glands are puffed up,
 and are soft, moveable, without adhesion and indolent.

The malignant scrophulae are evident from the Ja-genes
 of the tumour, its hardnes and adhesion; from its be-
 coming livid or red; from its being painful; and, when
 ulcerated, from the callofity of the lips of the ulcer, and
 from their difficult cure.

As to the prophagnias; the benign scrophulae admit of
 an easy cure, especially if they are feated in the conglom-
orate glands, and are moveable, superficial, and soft. Tho
 which attack the joints, the tendons, the ligaments, the
 bones, which are near large vessels, or comprefs the aper-
 ra arteria, or the oeosphagus, are very difficult to cure.
 The internal scrophulae are much more dangerous than the
 external; for when they turn to an abfece, they are incu-
 rable. They are also more or less troublesome in propor-
tion to the progress they have made, the parts which they
 attack, and the temperament of the patient. If the tumours
 have been long ulcerated, and are become sinous and vi-
 rulent, and if they lie near one another, they often find a
 communication, though they appear distinct: In this cafe
 the lips grow callous, and the ulcers corrosive, frequently
 fordid; and the cure is not to be expected as long as one
 cylis remains of the veifs that feed them. Thofe who
 are feized with it from in the neck after forty years of age,
 seldom recover.

If ftrumous tumours arise from a caries in the bones of
 the fingers or hands, the cure is difficult; but more fo in
 the feet and toes. If in the os calcis, joint of the ancle,
 or affragalus, or in the knee-bones, or itchia, or the like,
 where they cannot be safely laid open, the cafe is deplo-
rable, and the patient generally dies of a marasmus.

In the cure, the diet should be thin and attenuating,
 light and easy of digestion; and all falt and smoke-dried
 meat should be carefully avoided; as also beef, pork, fi-
h, hare, cheese, and in general all things that are hard of
 digestion, or which yield indifferent nourifhment. The air
 should be pure, sweet, and dry; and the body should
 be kept always open.

The cure may be begun by bleeding, especially if the
 patient is plethoric, and then a mercurial or antimonial
 vomit; after which he should take a gentle purge, often
 repeated, fuch as the common purging potion of Syden-
 ham; and, as almost all remedies which are good in ve-
 nereal cafes are useful in this, mercurial vomits and purga-
tives will be proper.

Some give ethiops mineral alone for three months; be-
 guing with twelve grains, and increasing the dose gradu-
 ally to a scruple, or half a dram, and decafeing in the fame
 manner.

It is certain that the united force of mercurials and an-
 timonials will do wonders in these cafes, if prudently gi-
 ven and long continued; always beginning with small doses
 at first.

Some make ufe of the decoction of sponge; the dose
 is four ounces: others, burnt or calcined sponge; the
dose is half a dram morning and evening. Turner
 mentions a cure from an electuary made of the moft
 gritty and fabulous sponges that could be got, which
 were dried in an oven so much as to be fit to pulverize.
The dose was a spoonful night and morning.

Others recommend the absorbent powders and diapho-
 retic antimony; others again, tincture of antimony in a
 glass of the decoction of the woods; Dr Francis Fuller,
 the decoction of colts-foot used for a long time. Fallopis
 praiseth the root of butchers-broom; the dose is a dram
 with x, gr. of the root of common flower-de-luce. Arna.
d de Villanova looks on the root of scrophularia or figwort
 as a specific; the dose is a scruple in powder. And Alken
 mentions two cures performed by white arcbangle, boiled
 in milk, which it coagulates; the whey of which must
 be drank, and the card applied to the fores. Of late the
 mineral waters of Moffat in Annandale have been drank
 with great advantage.

Ephom salt dissolved in a pint of water in such a quan-
tity as to keep the body open, and taken like sea water,
has often cured this disease.

After all, we have another medicine whose virtues in
 curing this disease have been lately celebrated, viz. the
 jujuits bark.

1. Take of the beef rhubarb, half an ounce; of flo-
 rentine
A Cancer is a hard, round, unequal, painful, and generally-immovable tumour, of a livid, blackish, or leaden colour, surrounded with swelled, crooked, varicous ves-
Of the Elephantiasis, or Leprosy of the Arabians.

The leprosy is said to be of two kinds; that of the Greeks, and that of the Arabians. The latter is called elephantiasis, from the roughness, inequalities, and tubercles in the skin, resembling that of an elephant. Lucretius supposed it to be generated in Egypt, and no where else; but if the leprosy of the Jews is the same as that of the negroes, which is highly probable, then we may affirm that it is endemic to the southern and inland parts of Africa.

That it was contagious, all histories agree, as well as the Periplus; and the Periplus would not let a leprous person come within the city-walls.

Pliny informs us, that the first appearance of the elephantiasis is in the face, particularly a small speck appears on the nose or nostril; and, as the disease increases, the whole body is full of spots of various colours; the skin is thick in one place, and thin in another, hard and rough, with scabs. In process of time, the skin turns black, and the disease eats away the flesh to the very bones. Celsus observes, that the spots grow tumid and red, and then turn black, and the skin is covered, as it were, with scales. Then the body falls away, the mouth, legs, and fingers swell, and the fingers and toes are hid with a swelling; even the bones themselves do not escape; afterwards a fever arises, to which the patient falls an easy victim.

But to let this matter in a still clearer light, it will be necessary to add the description of this disease from Guido de Chaulias. The leprosy, says he, commonly begins in the face and forehead, in which filthy tubercles make their appearance, and by degrees spread all over the body. The eyebrows swell; the nostrils grow wider outwardly, and straiter inwardly; the lips are disfigured with an unhallowed tumour; the voice is hoarse and snuffling; the ears are turned back; the forehead is protuberant; the face is of a purple colour; the veins under the tongue are varicious and black; the muscles between the for- finger and the thumb are eaten away; the hair falls off from the head and eyebrows; afterwards the skin of the whole body becomes black and full of spots, rough and unequal, with crusty scabs full of knobs and fissures, of horrible aspect, which makes it appear like the skin of an elephant. After this, the fingers and toes begin to swell; and then the legs, which, being covered with rugged inequalities, seem like two sticks for magnitude. Besides all this, the patient is infatiable with regard to vernereal pleasures. The blood is fetid, spotted and black, and will not coagulate.

This disease is hereditary and infectious: for it may be caught by the saliva of a leper, if a found perfon drinks after him; by touch; by lying in the same bed; and by coition.

An inveterate leprosy was judged to be absolutely incurable. But Aurelius says, when the disease is new and recent, there are hopes of a cure. What he and Celsus prescribe in order to the cure, are not worth repeating; for, if any medicines will do, they must be of the Herculean kind. Authors are excessive in the praise of viper’s flesh, which Hoffman judges to be quite insignificant. Joel advises bleeding and purging, with zyg grains of the extract of black hellebore, or ij gr. of the glaft of antimony in conserve of rose; but the vitrum ceratum is more safe, and may be given in a larger dose. Towneconfesses, that antimonial preparations yielded most relief in Barbadoes; but he could not say that they perfected the cure. On the other hand, mercury exasperated the disempem, irritated the ulcers, and made them spread the faster.

Of the Impetigo, or Leprosy of the Greeks.

This disease begins with red pimples or pustules breaking out in various parts of the body; sometimes they appear single; sometimes a great number arise together, especially on the arms and legs: as the disease increases, fresh pimples appear, which joining the former make a fort of clusters, all which enlarge their borders and spread in an orbicular form. The superficies of these pustules are rough, whitish, and scabby; when they are scratched, the scales fall off; upon which a thin ichor oozes out, which soon dries and hardens into a scaly crust.

These clusters of pustules are, at first, small and few, that is, three or four in an arm, or leg only, and of the size of a silver penny. But, if the disease is suffered to increase, they become more numerous, and the clusters enlarge their circumference to the bigness of a crown-piece, but not exactly round. Afterwards it gradually increases in such a manner that the whole body is covered with a leprous scurf.

Willis
itching is greater, are between the fingers, on the arms, dry ford chiefly attacks those that are lean, old, or are places where the eruptions appear very numerous, and the a flight inflammation, which is manifest from the redness of a melancholico-choleric constitution: In these, the pudules are much less, and excite a most intolerable pulation; the pusules are more full of purulent matter, attended with dren and the sanguineo-phlegmatic are most subject, the head only excepted. In the milder sort, to which chil- tion of a serous lymphatic matter, sometimes attended from thence spreads by degrees over all the body, the fymptoms. The itch of the milder sort appears either drinking in bed after it a pint of some proper decoction.

The cure may also be performed with alterative and dia-

But, if these fail, recourse must be had to mercury, which some, after extinction, mix with flowers of sul-

Among those things which stimulate the solid parts to

But if these fail, recourse must be had to mercury, which some, after extinction, mix with flowers of sulphur and camphor, and rub it on the joints to promote a salivation: others more properly give mercurius dulcis, with double the quantity of crabs-eyes and calx of anti-

The itch is a cutaneous disease, arising from a corrupt-

Of the Itch.

This disease is, truly and properly speaking, a disease of the skin; because it often is safely cured by topics alone, if timely applied. It is contagious, and may be caught by drawing on a glove or flocking, lying on the linen, or lying in sheets after persons infected with this malady. Some think it owing to an impurity in the fo-

The cure of the itch is no way dangerous, and very easy to cure; but the moist more easy than the dry. While it is recent and superficial, it much sooner yields to remedies, than when it is deep, and has infected the mafs of blood; and the cafes is till worse, if there be any fault in the viceurs: it is most difficult in old persons than young; in a leuco-phlegmatic or hydroptic disposition, as also in a very dry hectic one, it is hard to cure; and, when it becomes universal, it may bring on the leprosy.

The patient should avoid shell-fish, and all salted and high seasoned meats; as also wine, spirituous liquors,

When the blood is thought to be foul, it will be pro-

It has been a very common practice to cure the itch by quicksilver girdles; but Turner thinks them too hazar-

But after all this, if the disease should prove so flub-

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The itch of the milder sort is noway dangerous, and very easy to cure; but the moist more easy than the dry. While it is recent and superficial, it much sooner yields to remedies, than when it is deep, and has infected the mafs of blood; and the cafe is still worse, if there be any fault in the viceurs: it is most difficult in old persons than young; in a leuco-phlegmatic or hydroptic disposition, as also in a very dry hectic one, it is hard to cure; and, when it becomes universal, it may bring on the leprosy.

The patient should avoid shell-fish, and all salted and high seasoned meats; as also wine, spirituous liquors,

Instead of repeating purging, it is common to give flowers of sulphur in milk, or treacle, with good successe.

Willis and many others have a great opinion of the ef-

The itch is a cutaneous disease, arising from a corrupt-

If the body is phlegoric, we are to begin by bleeding, and afterwards to pursue it by purging, which cannot safely be omitted.

Of the Itch.

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Of the Itch.
the cafe is so desperate as to render it absolutely necessary.

Of \textit{Hæmorrhages in general.}

The blood, which flows spontaneously, generally proceeds from those places which are of a fine and thin texture, in whole surface the slender vessels creep along with various meanders; such as the inward part of the nostrils, the bronchia of the lungs, the flesh of the gums, the left side of the stomach, the gut ilium, and the extremities of the rectum, as also the external substance of the womb and vagina. When these parts are distended, and the small arteries open, the blood often breaks out with violence.

Sometimes, though but seldom, hæmorrhages happen in other places where the vessels lie deeper; as from the little finger, from the hand and knee, the breasts in the time of menstruation. There are likewise instances of periodical fluxes from the penis in men.

They generally happen to persons whose bodies are of a soft, fpongy, tender texture, and whose vessels are turgid with blood and fever. These were formerly said to be of a fanguine constitution, and are subject to hæmorrhages as long as they live. But the choleric, who have larger vessels, whose fibres are more strongly braided, and whose blood circulates with greater rapidity, are liable to a spitting of blood in their youth. The fanguineo-melancholic are subject to the bleeding piles; and to those who have lost a large limb, or who labour under obstructions of the liver and spleen; hence, in an inveterate surry, dropy, and cachexy, there often happens a fatal hæmorrhage.

It differs much as to the quantity; some lose only a few drops, some several ounces, and some five or six pounds. No hæmorrhage is more apt to return; which it does in a few days, to others in a few hours.

To the plethoric it is generally salutary; and there are many instances of a vertigo, a giddiness, dull heavy pains of the head, a phrenzy, and even an epilepsy, being carried off by a bleeding at the nose. On the contrary, from its suppression there have arisen vertigoes, apoplexies, convulsions, noise in the ears, and hardneshes of hearing, and even a gutta perena.

These hæmorrhages are critical and salutary in a synochus on a fermentative day, that is, between the third and fourth, or on a critical day, viz. the seventeenth; for, as these fevers are generally caused by a plethora, they are carried off that way.

But enormous and long-continued bleedings at the nose, when they arise from fponias of the internal parts, and are preceded with coldness of the extremities, and fainting fits, generally terminate in death.

After a revulsion by bleeding, there is nothing equal to nitre to appease the orgasm of the blood, and to relax the spasmodic striae. Next to these are vegetable acids; such as the juice of Seville oranges, barberries, the water and juice of wood-forrel; but more especially the diluted spirit of vitriol, tincture of roes, made with the water of wood-forrel and the spirit of vitriol, and drank with spring-water. [Five or six spoonfuls of the common tincture of roes may be given at a time, and repeated as occasion requires.] If the bleeding is very inordinate, it will be proper to use cooling emulsions, gentle or stronger opiates to moderate the spasmodic striae, as occasion shall require. Camphor, mixed with nitre and calx of antimony, will be highly necessary, if the matter of exanthemata or cutaneous eruptions is the cause of the hæmorrhage, as is often the case.

A revulsion may be made from the head, by bleeding in the lower parts; then by temperate pediluvia, and putting the hands into warm water.

As there is often an acid bilious matter lodged in the hypochondria, the parent of wind and fponias, the powder of rhubarb will be proper, mixed with a few grains of tartar-vitriolate and nitre; as also emollient and carminative clysters, with a due proportion of oil.

Externally, refrigerants may be mixed with discutients, and applied to the forehead, nose, and neck.
But it must be noted, that, when the patient is plethoric, the bleeding must not be stopped hastily, if at all; nor when the menes in women have been suppressed, or the lochia, or the bleeding piles in men accustomed thereto; much less must a flowage be attempted when the bleeding itself is periodical.

In persons of a bilious constitution, cold water alone, drank freely, has had a good effect.

The cachetic should persiffl long in the taking of rhubarb, either alone, or mixed with digestive salts, such as tartar-vitriolate. If there is any scorbatic disorder in the viscera, besides rhubarb, the patient should drink plentifully of whey.

If any disease proceeds from the cessation of this customary hæmorrhage, it should be promoted with a pen or a straw thrust into the nofe.

Some recommend the weaker spirit of vitriol, and would have eight or ten drops of it be given in every draught of liquor. But perhaps the best method of all in obstinate hæmorrhages is that recommended by Mead in the bloody small-pox; or the Peruvian bark alone will generally be sufficient.

Of the Bleeding and Blind Piles.

A Flux of blood from the hæmorrhoidal vessels is called the bleeding piles; when the vessels only swell and discharge no blood, but are exceeding painful, they are termed the blind piles.

All copious fluxes of blood from the anus are not to be reckoned of the morbous kind. For the habit of body, strength, age, and temperament, are to be considered. That which is enormous and excessive to one person, may be moderate and salutary to another. That only is to be esteemed pernicious, which continues too long, and enfeebles the patient; whereby digestion, nutrition, and other functions are hurt, and there is reason to fear the production of dangerous chronic diseases.

An excessive hæmorrhoidal flux is generally preceded by a heavy pressing pain of the back and loins; sometimes a numbness of the legs and thighs; a constrictio of the external parts, with a flight flivering, and a subsidence of the vessels therein; a hard contracted pulse; a dryness of the mouth and face; the urine diminished in quantity, and most commonly pale; a senfe of weight about the anus extending to the perineum; a weakness of the stomach; a flatulency in the lower belly; a frequent desire to make water and to go to stool, with sometimes an exclusion of white bilious mucus; the old and weak have procidentia ani.

In this case, the blood is generally at first black and very gumous, and sometimes comes away in large clots from the varieous vessels; afterwards it becomes red, and at last serous: sometimes it is of a slimy, or like the white of an egg. There are instances of voiding a pint or a quart of blood daily; it often continues long, from twenty to thirty, or even forty days.

This flux entirely proceeds from the hæmorrhoidal vessels. The external or blind piles seldom bleed, but turn to painful varices; which being opened weep a little, but will not yield much blood. But the internal piles, which are the offspring of the splenic branch, and are extended to the inner substance of the reftum, and as far as the sphincter of the anus, together with the small arteries derived from the lower metarteria, not only bleed plentifully, but, when the flux is suppressed, create diseases of the liver, spleen, pancreas, mefentery, and intestines.

The persons subject to this disease are those of a loose, spongy texture, of a bulky size, who live high, and lead a sedentary life; or to whom it is hereditary. Sharp purges, aloetica, high-seasoned food, free drinking of sweet wines, neglect of customary bleeding, anger, fadness, hard riding, and the like, will usher in this disorder.

This hæmorrhage is dangerous, because it decays the strength, wastes the body, and produces a fenfe of weight in the thighs. The sleep is laborious, and the praecordia oppressed; there is a rumbling in the belly, and a weak pulse. When it continues long, the ankles swell, and the countenance is ghastly; there is a ftraitnefs of breathing; and laft of all it terminates in a cachexy, dropfy, or a flow and hectic fever.

If the patient is plethoric, bleed; and let his drink be cold water of the chalybate kind, or whey turned with orange-juice; or juleps made with tincture of rofes, cooling waters, and syrup of rofes; likewise nitre in powder, with absorbents and strentheners; and, to appeafe the flapsms, opiates of the mildeflf kind.

If it continues long, and the flux begins to be serous, then give rhubarb with curants or tamarinds, or, which is much the fame, with cream of tartar. Then gentle diaphoretics may be compounded of burnt hartthorn, calx of antimony, wine-vinegar mixed with crab's-eyes, water of elder-flowers, simple alexitereal water, and diafordium; or hot decoctions of yarrow, veronica, &c. may be taken in bed, in order to sweat; also half a grain of camphor, mixed with nitrous and bezoaric powders.

In the B!nd Piles there is a most intense pain, especially at the time of going to stool, and the excrements are tinged with blood. Sometimes tumours like warts lie hid in the sphincter, or appear in the verge of the anus.

Sometimes the veins, in the blind piles, are so much dilated with blood as to be very painful, and raise tubercles as large as peas, grapes, or eggs: They appear liquid, and black, from the stagnation of a thick blood, and, when pressed with the fingers, feel like a bladder filled with liquor. Some are soft and indolent; others hard, inflamed, and painful; render the patient unable to walk, stand, or fight; and produce such a spasm in the anus as not to admit a clyfter. Sometimes they bleed, or turn to troublesome itching ulcers, and occasion an abfece or a fistula.

Linen dipped in warm spirits of wine, and emollients, are often of infinite service; and, when they fail, leeches may be applied to exhauft the blood: If they are not at hand, and the parts are inflamed, the lancet must be used; then dressings must be made with lint, with compresses and the 'T bandage. The tubercles, which are full and large, may be removed by a ligature, unless inflamed. Sometimes they are high in the reftum; and then a fasculum ani must be used; in which case they must be either scarified with a lancet, or divided with scissors, that the thick noxious blood may be discharged, and the pains relieved.
MEDINE.

Of the Immoderate Flux of the Menses.

The symptoms which attend this disorder, are loss of strength, anxiety of the precordia, fainting, coldness of the extremities, paleness, convulsions, suffocations; and, when it is inveterate, oedematous swellings of the feet, a cachexy, droppings, the flux album, a hectic fever, and an atrophy.

Sometimes the flux returns twice in a month; and at others continues several days longer than usual. It comes sometimes before and sometimes after abortion. Sometimes florid blood rushes out with impetuosity, most frequently before a miscarriage, and after it from a retention of part of the afterbirth, which keeps the orifices of the vessels open. Sometimes clots of blood come away of the size of an egg, when the menses have been stopped for two or three months. A black, grumous, coagulated blood will now and then come away on the first days of childbed, when the patient is slender and plethoric. In the cachectic, the flux will be often thin and watery; in the scrobutic and fetid, attended with sharpness and pain.

It is sometimes caused by a great afflux of blood to the uterus, which is not returned in due quantity by the veins; for which reason the vessels often burst. The same happens from a plethora, and from hard labour. About the fiftieth year, when the menes cease spontaneously, a great and sometimes dangerous flux will happen, and then quite disappears. If it should suddenly and unexpectedly return about sixty, with flooding, it brings on a fatal hectic fever.

This disease is generally preceded and accompanied with a tension and inflation of the hypochondria; a heavy, pressing pain about the loins, with a chills; as also a coldness of the extreme parts, a subsidence of the vessels, a paleness, a quick pulse, an inward heat, a coliciveness, and little urine.

If a child-bed woman is not sufficiently cleansed at her lying-in, a great haemorrhage will follow some months after, with fainting fits, and will not terminate till the excretion of a carnous mass as big as one's fist, which the sex call a mole.

If the body is cachochymic, and fall of depraved juices; scorbute, or infected with the venereal lues; when the visceræ are unfound, and the liver, spleen, and meferia vessels are fluffed with a black, thick blood; this disease is not without danger. The patient's life is greatly in danger when the child is dead before delivery, and a great flux of blood happens. It is dangerous when caused by a violent extraction of the afterbirth; or when pieces of it are left behind, which afterwards become moles, and greatly vitiate and increase the menstrual flux.

If the patient is plethoric, bleed in the arm. If there is no flux, or if it proceeds from the kidneys or bladder, which may be either enlarged, broken, or eroded. It is more or less dangerous, according to the different circumstances which attend it.

If pure blood is voided suddenly without interruption and without pain, we may conclude it proceeds from the kidneys. It likewise comes from the kidneys, if the urine is coffee-coloured or more florid, and generally precedes a fit of the gravel, but sometimes accompanies the passage of a stone through the ureters. But if the blood is small in quantity, and of a dark colour, with or without purulent matter, chiefly if it is emitted with heat and pain in the pubes, it certainly proceeds from the bladder. This is sometimes attended with fainting, difficult breathing, a low, small, and frequent pulse, a nausea, anxiety, and cold sweats.

When it proceeds from the ureters, which are hurt by a large, rough stone, and a small quantity of blood is mixed with the urine, there is a sharp pain in the loins and ilia, and a difficulty of making water, which when made has a fabulous sediment, and other signs of a stone flicking in the ureter. When the coats of the bladder are hurt by a stone, and a little blood follows, it is attended with a mott acute pain and a previous stoppage of the urine, together with grumes and fabulous concretions; which also sometimes happens when a stone is firmly fixed in the kidney.

It may be occasioned by a stoppage of the haemorrhoidal flux; from violent motion of the body, especially riding; from a stone concealed in the kidney: from an erosion and ulcers of the bladder; from external violence; from grapping pains caused by violent purges; from sharp diuretics, especially cantharides.

All bloody urine has some degree of danger; but it is most so when mixed with purulent matter.

If the patient is plethoric, or if it proceeds from the suppression of a fanguineous evacuation, bleeding is necessary; as also cooling nitrous draughts, and purified nitre mixed with absorbents, with whey for a vehicle, or barley-water.
water, or small-beer, acidulated with some drops of the spirit of vitriol. The body must be kept open with laxatives, as rhubarb with currants, or with cream of tartar; as also emollient clysters. The relaxed vessels must be agglutinated with decoctions of vulnerary herbs; such as agrimony, ground-ivy, yarrow, golden rod, and the roots of comfrey dulcified with virgin-honey, to which milk may be occasionally added. Almond milk is likewise good, especially if used as a vehicle with bole-armeniac.

If there is an ulcer in the kidneys or bladder, medicines must be given that thermate the acrimony; such as syrop of marshmallows; also infusions of the vulnerary herbs above mentioned; likewise of the bark of the roots of acacia and cherry tree gum.

When gravous blood plugs up the passage of the ureters into the bladder, or the sphincter of the bladder, and occasions a difficulty or stoppage of urine, warm water drank plentifully, and baths of the fame, are useful; likewise warm water should be injected into the bladder with a syringe, that the sharp humour may be diluted and the grumes dissolved. But, if the urine should be quite stopped with a spasm, then give emulsions of the four cold foods, with crab's-eyes and calx of antimony; or a powder made of sperma ceti, crab's-eyes, and nitre. Externally, apply a bladder filled with the decocction of emollient flowers in milk to the abdomen; and keep the body open with manna, or as emollient oily clyster.

Milk and whey are likewise excellent in these disorders, if a dram of bole-armeniac is taken in every draught.

Of the Lethargy, Carus, and other sleepy diseases.

The lethargy has some affinity to the apoplexy and palsy, and often attends them.

By sleepy diseases are meant a preternatural propensity to sleep, sometimes attended with, and sometimes without a fever: The immediate cause of which is a very languid and diminished influx of the animal spirits from the cortical part of the brain into the medulla oblongata, and from thence into the nerves defined for sense and motion.

There are several kinds of these disorders, the principal of which are a coma vigil, a coma fomnolentum, a carus, and a lethargy.

A coma vigil is known by these signs: a burning and extensive pain in the head, attended with a sense of ebullition therein; they have a strong inclination to sleep, and yet either don't sleep at all, or, if they do, awake immediately with little relief, but have no delirium. This coma differs from the pervigilium, which is frequent in acute fevers, for in this there is no propensity to sleep. This disorder is always symptomatic, and often attends acute, burning, and malignant fevers; as also an inflammation of the dura mater, and utters in a phreny.

In a coma fomnolentum, the patients are languid, and their chief complaint is a constant drowsiness. They often fall asleep at their meals, in conversation, and in the midst of bufines, and, when they are awakened, soon fall asleep again. This disorder principally feizes old men, who live luxuriously, and neglect bleeding. It is a primary disease, and without a fever.

A carus is a profound sleep, out of which the patient cannot be roufed by clamours, shaking, nor even with the picking of a needle; or, if they are sensible of the pain, they continue silent, and fall asleep again. It is sometimes a primary disease, and sometimes symptomatic. When it is symptomatic, it is of three kinds: The first happens in acute fevers, in the beginning or increase; and, if the convulsions and hiccups supervene, it is soon fatal. The second comes after acute fevers; and, when the patient is extremely weak, the sleep will continue for several days; being awaked, he will answer questions, but immediately fall asleep again. When he recovers, he remembers nothing that he laid. If it happens in acute fevers, on critical days, with a sweat, it is a good omen. The third happens a day or two before death: for, the patient's strength being exhausted, he lies deprived of sense and motion, as it were in a profound sleep, and under that expires.

A lethargy is a heavy and perpetual sleep, with scarce any intervals of waking. It is attended with a stupidity, and so surprising a forgetfulness, that, when the patient yawns, he forgets to shut his mouth; or, if he takes the chamber-pot to make water, he forgets to do it, and falls asleep.

A lethargy is attended with a fever, which is a symptom thereof, and is chiefly discovered by the frequency of the pulse; whereas a carus is often a symptom or a consequence of a fever, and is likewise attended with insensibility. It does not invade so suddenly as an apoplexy, which is attended with an abolition of all sense and voluntary motion, and kills sooner than a lethargy.

In the cure of these diseases, three intentions should chiefly be regarded: 1. To roufe the patient from sleep. 2. To remove the difficulty of circulation, and the stagnation or extravasation of the blood or serum in the head. 3. To restore the strength of the membranes and vessels of the brain.

These remedies are efficacious in the first case, which act on the nervous parts, by inducing a tremulous and oscillatory motion through the whole nervous system: such as powerful acids, mixed with tincture of castor; volatile salts; fetid things, as galbanum, burnt partridges feathers; cold water thrown on the head; cataplasms made with vinegar, rue, bay-leaves, tops of savory, mustard-seed, calfor, and camphor, applied to the head, forehead, and temples.

The ferous colluviae is derived from the head by stertoratories; the bull is ten grains of salt of white vitriol dissolved in half an ounce of marjoram water, and drawn up the nofe; blisters on the feet and neck; cupping-glares, either with or without scarification; strong frictions on the lower parts; stimulatory clysters, with the addition of sal. gem. common salt, or the root of squills.

To remove the stagnation, and promote the circulation, if the vessels be turgid with blood, venaeceation is necessary; then gentle laxatives, and nervous medicines with diaphoretics. A powder made of salt of hartshorn, salt of amber, cinnabar of antimony, and bezoar mineral, has very great and salutary effects.

A carus, especially the first species of it, requires plentiful bleeding; and the patient must be roufed by clysters, rendered stimulatory with the powder of squills; by blisters; by putting distilled vinegar in the nostrils; and
and by appeasing the organ of the fluids with cooling fixed diaphoretics and acids. The second species requires but little or no assistance; and the third is incurable, at least if blisters fail.

A coma somnolentum is divided into serous and sanguine. The first requires the natural serous evacuations to be restored or promoted. Gouty fits are to be invited by frictions of the feet, blisters, relaxing applications, and warm baths. Sternutatories are of great use, as they discharge the serum through the nose, and stimulate the nerves. When a viscid phlegm offends the stomach, vomits are useful, with half a scruple or a scruple of powder of squills, or ij gr. of emetic tartar, with a laxative potion.

In a sanguine coma somnolentum, when the blood circulates slowly, or flags in the head, as in the hypertensive or scorbutic, all hot spirituous remedies are as bad as poison: But bleeding, chysters, gentle laxatives, cooling and nervous powders, are useful.

A red face, eyes turgid with blood, indicate bleeding. Warm baths are bad in all sleepy disorders; likewise salfron, poppies, and opiates of all kinds.

Of the Catalepsy.

The catalepsia is also called catochus, and catoche; and whoever is affected with it is in an infant rendered as immovable as a statue, without sense, and without motion; and continues in the same posture they were in at the moment they were seized.

The proximate cause of this disease is the immobility of the common senory from the time of the first attack; therefore there is an absolute rest of the blood in the brain, of the glands of the brain, and of all its emissaries; whereby all the functions of the brain are injured, as well as those that depend thereon: The muscles only remain tense as in the beginning; the respiration and pulse indeed continue, but they are very faint.

But Hoffman afferts, that the pulse is natural, and the breathing free and easy; that the limbs are moveable, but remain in the same situation in which you place them. They neither hear nor see, though their eyes are open; nor feel, though they are pricked ever so much; yet, if you thrust any thing into their mouths, they will swallow it: But their bodies are so bound, that you cannot thrust the fineft pipe into the anus. The colour of the face continues florid. At last they fetch deep sighs, and come to themselves, and tell wonderful things of what they have seen and heard during the paroxysm; some declare they have enjoyed exquisite pleasures, or seen tragicall sights, or have had divine visions, and the conversation of angels.

This disease is generally preceded by obdurate intermitting fevers, especially quartans; by a dry, melancholy, lean temperament of body; by a retention of the menphis, and hemorrhois; by great and sudden frights; by a profound, constant, fixed meditation on one object; or by strong fevers in persons of a sanguine constitution.

The method of cure is various, according to the different causes. The patient should be excited with things that greatly strike the senses; such as light, noife, stimulating things, volatile salts, pain, frictions, continual agitations; by causing an hemorrhois of the nose; by promoting the hemorrhoidal or menstrual flux; by fernu-
On the other hand, those who live a sedentary life, feed violent passions and commotions of the body and mind. Prized of all senses and motion, they immediately fall down. Pression of the menstrual flux. It likewise oftentimes comes grievous passion of the mind; or maids, after a sudden supposition of the belly, that no flatus can be emitted, nor no stricture the belly, that no flatus can be emitted, nor no stricture the belly, that no flatus can be emitted, nor no stricture the belly, that no flatus can be emitted, nor no stricture the belly, that no flatus can be emitted, nor no stricture the belly, that no flatus can be emitted, nor no stricture the belly, that no flatus can be emitted, nor no stricture.

An hysterical fit is generally preceded with a paining pain in the forehead, temples, or eyes, with an effusion of tears and dimness of sight, a dulness of the mind and senses, and a loathing of all things. When the fit comes on, the patient is exceeding coltive, and yet has a strong stimulus to discharge her urine, which is as clear as water; the breathing is uneasy, difficult, and short; and a langour seizes the whole body. To these succeed a pain in the loins, and a great swelling and shaking; the belly is hard and inflamed; afterwars the navel is drawn inwards, and outwardly leaves a great pit; then they feel a fort of a globe arise from the lower part of the belly to the hypeochondria and diaphragm. Soon after, the heart begins to flutter and beat, with a hard, unequal, and sometimes intermitting pulse; the extreme parts grow cold; the fauces are straitened, and seem to be bound with a cord; the face is pale, the breathing exceeding difficult, the voice ceases, the pulse is almost imperceptible; and there is such a stricture of the belly, that no flatus can be emitted, nor no stricture given. In some there are convulsions of the head and limbs; others lie in a profound sleep, without sense or motion; others have their face and neck look red and inflamed, with a strong pulse; and others again break out into immediate laughter, and, regaining their voice, say a great many silly things.

When they begin to come to themselves, the pulse, which was before weak, languid, and obscure, becomes brisk, soft, and strong; heat returns to the extreme parts; the face which was pinched in and pale, begins to expand and look ruddy; the wind forces its way upwards; there is a rumbling in the belly; and at length the patients, waking, to discharge her urine, which is as clear as water; the breathing is uneasy, difficult, and short; and a langour seizes the whole body. To these succeed a pain in the loins, and a great swelling and shaking; the belly is hard and inflamed; afterwars the navel is drawn inwards, and outwardly leaves a great pit; then they feel a fort of a globe arise from the lower part of the belly to the hypeochondria and diaphragm. Soon after, the heart begins to flutter and beat, with a hard, unequal, and sometimes intermitting pulse; the extreme parts grow cold; the fauces are straitened, and seem to be bound with a cord; the face is pale, the breathing exceeding difficult, the voice ceases, the pulse is almost imperceptible; and there is such a stricture of the belly, that no flatus can be emitted, nor no stricture given. In some there are convulsions of the head and limbs; others lie in a profound sleep, without sense or motion; others have their face and neck look red and inflamed, with a strong pulse; and others again break out into immediate laughter, and, regaining their voice, say a great many silly things.

The hysterical passion attacks women that are pregnant, in child-bed: widows that are full of blood, after some grievous passion of the mind; or maids, after a sudden suppression of the menstrual flux. It likewise oftentimes comes on so suddenly, violently, and at unawares, that being deprived of all sense and motion, they immediately fall down.

This disease may be caused by whatever promotes a more plentiful and rapid afflux of blood and the genital fluid to the uterine parts, or impedes the eruption of the menes, or occasions their suppression: hence maids and widows are most subject thereto; also women of a languid or bivious constitution who live high, drink generous wines, feed on high flavoured aliment, and are subject to violent passions and commotions of the body and mind. On the other hand, those who live a sedentary life, feed on coarse, acid, low diet, who have omitted usual bleeding, who are oppressed with sorrows, cares, and disappointments, are liable to this disease; for by these the blood is thickened, the solid parts weakened, and consequently the flowing of the menes rendered more difficult. Likewise sudden terror, and the body being exposed to uncommon cold during the time of the menstrual flux, by giving it a check procure hysterical spasms.

However dreadful and cruel this disease may appear, yet it is not very dangerous in itself, unless ill managed, or the patient be exceeding weak and vacuiterinary: it is most apt to turn into convulsions and an epilepsy. When it proceeds from abortion, or hard labour, it is very liable to return from any slight irritation of the nervous system. Nor is it very uncommon for the hypochondriac and hysterical disorders to be united, and then the cure is very difficult. This happens to women who lead a sedentary life, indulge extravagant affections of the mind, and are guilty of errors in diet and regimen.

In the cure, it must be carefully observed whether the woman is plethoric, or exhausted of blood and strength. In the former case, the spasms or convulsions are more violent, and copious bleeding is a present help; and many have been brought to themselves who were seemingly dead, if the florid colour of their faces had not shewn the contrary.

In the fit, it will be proper to apply fetid things to the nose; such as a Sophia, preparations of calomel, partridges feathers burnt, &c. For women in childbed, a girdle made of Russian leather, and bound pretty tight, is excellent. Likewise clysters made with roots and seeds of loviage, which are specifics, camomile flowers, elder-flowers, veronica, the carminative seeds boiled; to which may be added oil of elder, dill, or camomile.

Externally, plasters made of opoponax, bdellium, galbanum, fagapenum, and afa-fatida, may be applied to the navel; or, some greatly commend fumigations for the uterus of mukul, civet, florax, and benjamin.

Inwardly, the patient may take 30 or 40 drops of tincture of calomel in cold water.

Some hysterical disorders observe the lunar phases, and partake of the nature of an epilepsy: They seldom require bleeding, and purging should be used with caution: Emetics are of greater service, especially a little before the fit. In the fit, the bell medicines are those which repair the losses of spirits, as Russian calomel, gum-ammoniac, salt of amber in pills.

Out of the fit, native cinabarr and wild valerian root are most proper for correcting the juices.

To prevent its degenerating into a chronic disease, particularly the hypochondriac passion, care must be taken to keep the menes regular; which must be done by balfans, composed of myrrh and amber, with bitter and carminative extracts, especially zedoary and orange peel, made into an elixir, with a moderately spirituous menstruum. This, frequently taken, helps the digestion, and promotes a regular menstrual discharge.

But it is necessary to observe, that in hysterical cases remedies have a different effect on different women. Some cannot bear fetid medicines, which to others are an immediate
mediate relief. Some have fallen into a terrible syncope, and have come to themselves by sprinkling cold water on the face, when more powerful and spiritual things have failed. Others cannot endure hot things inwardly nor outwardly, as baths, fomentations, liniments, and nervous applications. Anodynes and opiates, which procure ease and rest to some, are very injurious to others who are greatly debilitated, and whole nerves are weak. Some have recovered from a violent paroxysm, by a draught of cold water; which, given to others, has increased the disorder.

Peruvian bark given morning and evening, a scruple at a time, is an excellent remedy in hysteric convulsions.

Of the Hypochondriac Passion.

The hypochondriac passion is a spasmodico-flatulent affection of the stomach and intestines, arising from an inversion or perversion of their peristaltic motion, and by a consent of parts, throwing the whole nervous system into irregular motions, and disturbing the whole animal economy.

This disease is attended with such a train of symptoms, that it is a difficult task to enumerate them all; for there is no function or part of the body, that is not soon or late a sufferer by its tyranny. It begins with cautions and windy inflations of the stomach and intestines, especially under the spurious ribs of the left hypochondrium, in which a pretty hard tumour may sometimes be perceived.

With regard to the stomach, there is a naufea, a loathing of food, an uncertain appetite, sometimes quite decayed, and sometimes strong; the aliments are ill digested, breeding acid and viscid crudities; there is a preference, heavy pain in the stomach, chiefly after meals; a spasmatic contraction of the gullet, a frequent spitting of limpid phlegm, an impediment of swallowing, a violent heart burn, a heat at the stomach, very acid belching, a reaching to vomit, vomiting, bringing up such acid stuff, that the teeth are not only on edge thereby, but the very linen or sheets are sometimes corroded.

In the volume of the intestines, especially the small ones about the navel, there are felt heavy excreting pains, wringings, gripplings, with a rumbling murmuring noise; in the gros intestines the pains are more acute. Sometimes there is a looseness, sometimes a most obilinate colliquenes, with a retention of the wind; which, when it breaks out either upwards or downwards, is attended with an alleviation of the symptoms, but they soon rage again with as great violence as ever. When there is a frequent urging to stool, tubercles generally arise, and the blind piles beset the anus; nay, sometimes a symptomatical flux of blood will burst out. Making water in some is difficult and painful; the urine is thin, limpid, and pale; sometimes it has a copious sediment mixed with fabulous concretions, and often resembles a fit of the gravel.

In the breath there is a great straitness, contraction, excessive difficulty of breathing, sometimes with a sense of fulness, a fluttering and palpitation of the heart.

As the disease increases, the head is molest with an headache, hemiplegia, various fixed spasmodic pains, and what is commonly called the claus of hystericus. A noise in the ears, with difficulty of hearing; the eyes are clouded with a cataract; some have double vision, or a pain and dryness of the eyes. In the tongue there is a most troublesome burning pain fixed to a certain space, with a plentiful excretion of spittle, as if the patient was in a false.

At length the animal functions are impaired; the mind is disturbed on the most trivial occasions, and is hurried into the most perverse commotions, inquietudes, anxieties, terror, fadness, anger, fear, or diffidence. The patient is prone to entertain wild imaginings and extravagant fancies; the memory grows weak, and the reason fails.

Peruons are most liable to this disease from twenty to fifty, and while solids are soft, lax, and flabby, and their blood vessels small; as also who are naturally languid, or have been weakened by tedious maladies. Likewise those who lead sedentary lives, and study too hard; in whom this is the peculiar disease of the learned.

The remote causes of these disorders are the suppreffion of the hemorrhoids and menfe, and other periodical fluxes of blood; an hereditary disposition thereto; a cold and moist constitution of the air; grofs, impure, flatulent diet; a sedentary, studious life; sadness, cares, troubles, intense thinking on a single object; tedious diseases not rightly treated; hard labour in child-bearing.

As to the prognostics, if the disease be recent and left to itself, it is rather troublesome than dangerous; but if it be inveterate, and not skillfully treated, or a bad regimen is followed, it is attended with more grievous symptoms, producing obstructions and ichirri of the vifera, a cachexy, a dropsey, an hectic, a convulsive althma, an incurable melancholy or madness, a fatal polyphus, &c. But if it is cured by a suppreffion of the menfe, or bleeding piles, the restoring the flux is the cure of the disease.

As continual fear and diffidence are symptoms of this disease, the patients are always foreboding terrible things, and live in constant dread of death; which render them fickle, impatient, and prone to run from one physician to another. Therefore, when a cure is attempted, they must be admonished to be constant and patient; and then the following indications may be purified: 1. To correct and evacuate the acid, vifcid, bilious flux, and flatulent fordes from the prime vise, which yield continual fewel to this disease. 2. The pulses being appeased, to restore the natural order of the peristaltic motion of the intestines, and to recover it from a languid state, that there may be a due concocition of the aliment, and a laudable chyle and other fluids generated. 3. To disperse the flagnated juices; to render the circulation of the blood equable through the abdomen and the rest of the body; and to free the fluids from all acrimony, after facilitating the excretions by urine and through the skin. 4. And lastly, to corroborate the whole nervous system.

To answer the first intention, nothing is better in the fit than clysters made with emollient herbs, water gruel strained, camomile-flowers, the tops of yarrow, the oils of sweet-almonds, dill, camomile, linseed, &c. adding a carminative species made of caraway, dill, but more especially cumin seeds. These should be repeated, if the spasms render them ineffectual. If the fces are harden-
ed, it will be proper to give oil of sweet almonds and water gruel inwardly. Nor must gentle laxatives of mannna, rhubarb, and cream of tartar, be neglected, with a few drops of oil of juniper.

If there is a great deal of acid flux in the stomach, the patient will be necessary, especially a little castor oil. It will also be proper to take a decoction of any of the following things in the morning in bed, to promote a diaphoretic, viz. baln veronica, betony, agrimony, stercordium, carduus benedictus, tops of yarrow, daily flowers, camomile flowers, fennel feed, &c.

To restore the digestive power of the stomach, give essence of orange-peel, tincture of tartar, dulcified spirit of nitre, &c.

The paroxysms are relieved by tepid pediluvia, made of wheat, bran, water, and camomile flowers. The feet must be put pretty deep therein.

Out of the dirt, to diffcuss the stagnation of the blood, bleeding in the foot will be necessary, especially at the equinoxes, and at other times as occasion shall require; but this should be after laxatives and pediluvia. If there is a disposition to an haemorrhoidal flux, leeches should be applied every month to the anus; and the patient should also take balsamic pills, with antispasmodic nitrous powders.

To strengthen the nervous system, nothing is better than chalybeates; for they, by a gentle affection, restore the nerves to their former strength. Outwardly a saponaceous plaster, with camphor, may be laid to the hypochondria with no small advantage.

Nothing is more friendly, nor gives greater energy to the blood and spirits, than riding on horseback almost every day, and for a considerable time together. Nor does riding in a coach want its share of salutary effects.

Of Melancholy and Madness.

Melancholy and madness may be very properly considered as diseases nearly allied; for we find they have both the same origin: that is, an excessive congection of blood in the brain: they only differ in degree, and with regard to the time of invasion. Melancholy may be looked upon as the primary disease, of which madness is only the augmentation.

When persons begin to be melancholy, they are sad, dejected, and dull, without any apparent cause; they tremble for fear, are delirious of courage, subject to watching, and fond of solitude; they are fretful, fickle, captious, and inquisitive; sometimes niggardly to an excess, and sometimes foolishly profuse and prodigal. They are generally covetous; and when they discharge their excrements, they are often dry, round, and covered with a black, bilious humour. Their urine is little, acid, and bilious; they are troubled with flatulencies, putrid and fetid eruptions. Sometimes they vomit an acid humour with bile. Their countenances become pale and wan; they are crazy and weak, and yet devor their victuals with greediness.

Those who are actually mad, are in an excessive rage when provoked to anger. Some wander about; some make a hideous noise; others hint the sight of mankind; others, if permitted, would tear themselves to pieces. Some, in the highest degree of the disorder, see red images before their eyes, and fancy themselves struck with lightning. They are so falacious, that they have no sense of shame in their venereal attempts. When the disease declines, they become stupid, sullen, and mournful, and sensibly affected with their unhappy situation.

The antecedent signs are, a redness and suffusion of the eyes with blood; a tremulous and inconstant vibration of the eye-lids; a change of disposition and behaviour; superficial looks, a haughty carriage, disdainful expressions, a grinding of the teeth, an unaccountable malice to particular persons; also little sleep, a violent headache, quickness of hearing, a singing of the ears; to these may be added incredible strength, infensibility of cold, and, in women, an accumulation of blood in the breasts, in the increasc of this disorder.

These things being duly considered, together with the state of the brain in persons who died of this disease, we may conclude, that melancholy is a strong and lively working of the fancy, with a fixed attention of the mind to a particular object, which it continually dwells upon; together with a delirium, a long continual dejection, dread and sadness without any manifest cause, arising from a difficult circulation of blood through the vessels of the brain, where it is too copiously congested and becomes stagnant. Madness is a violent rage, attended with狂热 and preternatural strength, caused by an impetuous motion of a thick melancholic blood through the vessels of the brain. It differs from a phrenzy, which is a delirium accompanied with a fever, and arises from an inflammatory stagnation of the blood in the brain: for we learn from experience, that all the shining faculties of the mind are changed or depraved, diminished or totally destroyed, when the blood and humours, receding from their natural temper and due quantity, are not conveyed to the brain in a moderate and equitable manner, but on the contrary with an impeded flow, and languid motion, or with too brisk and violent an impetus.

Both these disorders suppose a weakness of the brain, which may proceed from violent disorders of the mind, especially long continued grief, sadness, dread, uneasiness and terror; as also close study and intemperate application of mind, as well as long protracted incursions. It may also arise from violent love in either sex, especially if attended with despair; from profuse evacuations of the fermen from an hereditary disposition; from narcotic and stupefactive medicines: from previous diseases, especially acute fevers. Violent anger will change melancholy into madness; and excessive cold, especially of the lower parts, will force the blood to the lungs heart and brain; whence oppressive anxieties, sighs, and shortnesses of breathing, tremors and palpitations of the heart; thus vertigoes and a sensation of weight in the head, fierceness of the eyes, long watchings, various workings of the fancy intensly fixed upon a single object, are produced by these means. To these may be added a suppression of usual hemorrhages, and omitting culturmary bleeding.
bleeding: hence melancholy is a symptom very frequently attending hysterical and hypochondriac disorders.

The causes which contribute to the generation of a thick blood, are idleness and inactivity, which weaken the body, impair the functions, diminish the salutary excretions, and render the humours thick, viscous, and stagnant: All which are heightened by solitude, which is apt to give rise to various fantastic and gloomy ideas in the patient's mind.

Likewise acid humours in the stomach will increase the appetite, and tempt them to feed on coarse, gross, glutinous aliments, without drinking enough to dilute them sufficiently, whence a matter proper to nourish these diseases will proceed. It is evident from observation, that the blood of manic patients is black, and hotter than in the natural state; besides, the serum separates more slowly and in less quantity than in healthy persons. The excretions are hard, of a dark-red or greyish colour, and the urine is light and thin.

Diseases of the mind have something in them so different from other disorders, that they sometimes remit for a long time, but return at certain periods, especially about the full-moons, the times at which they first appeared. It may likewise be observed, that the raving fits of mad people, which keep the lunar period, are generally accompanied with epileptic symptoms.

This disease, when it is primary or idiopathic, is worse than the symptomatic that accompanies the hysterical or hypochondriac passion, which is easily cured; as is that also which succeeds intermitting fevers, a suppuration of the menes, the lochia, the hemorrhoids, or from narcotics. When the paroxysms are slight in the idiopathic kind, the cure is not very difficult: but if it is invereterate, and has but short remissions, it is most incurable; which is often owing to this, that they reject physicians and their medicines as poison. It is a bad sign, if, after a profound sleep, the patient still continues delirious, and is insensible of cold, or is unaffected with strong draffic medicines. If after want of sleep and long abstinence the patient is exceeding weak, or becomes epileptic, convulsive, or lethargic, death is not far off. Mad people are seldom subject to epidemic or other disorders. Pustules, the itch, and ulcers, have also done the same.

Sometimes this disease terminates by critical excretions of blood from the nose, uterus, or anus. Sometimes diarrhoeas and dysenteries will terminate these disorders. Pustules, the itch, and ulcers, have also done the same.

In the cure, bleeding is the most efficacious of all remedies; and where there is a redundance of thick, glutinous blood, a vein is first to be opened in the foot, then in the jugular vein, or in the nostrils with a straw; and, last of all, the frontal vein with a blunt lancet, for fear of hurting the pericranium, a gature having been first made round the neck to render the veins turgid.

Tepid baths are also convenient, to drive the blood from the head to the inferior parts; and before the patient enters the bath he should have cold water poured on his head, or it should be covered with a cloth dipped therein; for cold water pumped or poured on the head con-
tobacco; for it not only penetrates thick blood, but throws
the fluids into preternatural commotions. Change of air
and travelling may be beneficial.

Though in deliriums bleeding is highly useful, yet it
agrees best with those that are plethoric, bilious, and in
the vigour of youth: these likewise will bear frequent
purges of corrected hellebore; but then the strength must
be repaired by cordial, corroborating, and anodyne fe-
datives. When the patient is exhausted, bleeding is
hurtful, and reforatives good.

As a high degree of the itch has terminated these
diseases, it will be proper to make issues in the back, or
to procure ulcers with a potential cautery near the spine
of the back.

Sedative medicines are good; but not opiates and
narcotics, for these induce stupidity and folly. Those
that are good in an epilepsy, will be beneficial here;
such as caltor, flavings of hartshorn, the roots and seeds
of piony, and anti-epileptic powders, the valerian root,
flowers of the lily of the valley and of the lime tree.

And to the other fort of madness, which proceeds from
being exhausted and weakened by autumnal, violent, and
obfinate intermitting fevers, and from their being inju-
diciously treated with bleedings and purgings, it is only
to be cured by reforatives, cordials, and corroboratives,
long persifled in.

Of the Hydrophobia.

This disease, as it generally proceeds from the bite
of a dog, is called rabies canina, or the canine madness;
and from its most terrible symptom, the dread of water,
hydrophobia. It almost always arises from the infection
communicated by the bite of a mad animal: yet it has
been observed to arise spontaneously in some animals af-
fected with acute difeases.

Almost all kinds of animals may be afflicted with this
disorder, and may infect other animals, and even men;
as dogs, cats, wolves, foxes, horses, asses, mules, horn-
ed cattle, hogs, monkeys, and cocks; but it most fre-
fently attacks the dogs, wolves, and foxes, without any
previous contagion.

A hot climate, excessive heats and sudden colds; a long
and dry seafon; feeding upon putrid, flinking, verminous
flefh; want of water; worms generated in the kidneys,
guts, brain, or nozils; are the preceding caufes of mad-
nefs in these animals.

When they are going to run mad, they appear dejected,
shun company and hide themselves; they will not bark,
but seem to matter or murrur, and are averse to food
and water; they will fly upon strangers, but retain none
regard for their matter; their ears and tails hang down,
and they walk along as if they were sleepy. This is the
first degree of the difeafe; and, though the bite is then
bad, it is not at the worft. Afterwards they begin to
pant, hang out their tongues, froth at the mouth, and
gape. Sometimes they feem dull and half alfeep; some-
times they will run, but not directly forward, and soon
crave to know their mifters. Their eyes are dejected,
look watery and dirty, their tongues are of a lead colour,
they fall away suddenly, and grow raging mad. A bite
at this time is incurable; and the nearer they are to
death, with the more dreadful symptoms it is attended.

There is scarce any poison infectious so many ways as
this: for it takes effect through the cloaths, withoutfetch-
ing blood; by the breath of the animal drawn into the
lungs; by a touch of the froth, if recent; and by ap-
plying it to the lips or tongue, when it has been long
dried; or by kifing a dog that is mad; or by handling
the wound or instrument which was the death of the animal;
or by handling things which have been infected by any of
the former means.

Again, there is scarce any poison which produces such
terrible effects, and caufes such a wonderful change in the
perfon infected. When it begins to work, it is most
violent and quick; and yet, as it is said, it will some-
times lie dormant for years together before it exerts
itself. This diversity depends on the heat of the feafon,
the degree of the difeafe of the infected animal, and the
temperament of the perfon bit. For the bilious are soonest
affected by it; the phlegmatic and hydropic the leaft;
likewise something may be attributed to the way of living,
diet, and medicines.

A healthy man, infected with this contagion, finds the
effects of it discover themselves in the following order.
There is a pain in the place where he was bit, or received
the contagion; and then wandering pains in the other
parts, chiefly those that are near it; a latitude, heav-
nefs, littlefines of the whole body; inquiet troubled
fleep, and terrible dreams, with convoluiions, and labours
of the tendons; continual inquietude; fighs, fadnefs,
love of solitude. This ends the first degree of the difeafe.

Afterwards all the former symptoms increase, with a
prodigious straitnefs or oppression about the praecordia; a
difficult fighing respiration; horror; a fhaking and trem-
bling at the sight of any liquid, or bright, pellucid thing;
lofs of appetite; a poffibility of swallowing any thing
solid; but, if any liquid is touched with the lips and
tongue, it occafions an incredible anxiety, trembling, and
terrible convuluiions, almost forcing the patient into a rage;
then a vomitting of dark, bilious, vitious matter, or por-
ceous bile; an increafed heat, a fever, continual watch-
ing; a priepeps; a confufed feries of wild, extrarent
thoughts: Here the fecond degree of the difeafe may be
faid to terminate. Now all the symptoms grow worfe
and worfe: the tongue hangs out, and is rough; the mouth
is wide open; the voice is hoarfe; the thirst great;
strange horrors, flattering, and wild looks, at the fight of
water; a fothing at the mouth; an involuntary inclina-
tion to spit at the by-fladens, as alfo to bite them, which,
the patient cannot refift. He foams at the mouth, and
gruflhes with his teeth; and would do mifchief, if not
forcibly with-held. His pulse and breathing fail: there
is a cold fweat, and the higheft fury; yet during all this
time, which is wonderful, the patient continues in his
fenes, and is afraid of doing any harm. On the fourth
day from the firft degree of the difeafe, the patient falls
into convuluiions, with great difficulty of breathing; and
then dies.

The defcription of persons who died of this difeafe has
been given, that the organs of swallowing have been in some
measure inflamed; that various kinds of bilious vitious
vividities are collected in the flomach; that the gall-bladder is full
of
of a black bile; that the pericardium is dry; that the lungs are incredibly distended with blood; that the heart is full of an almost dry blood; that the arteries are full, and the veins almost empty; that the blood is very fluid, and will hardly coagulate when exposed to the air; whereas that which was drawn from a vein three days before, coagulated as usual; that all the muscles, viscera, brain, cerebellum, and spinal marrow, are more dry than common.

The prevention and care of this disease, except in a few instances, are very doubtful and uncertain: which may be attributed to the boasting pretences of some to specifics, and the neglect of a due method of care, founded on the history of the disorder.

So far therefore as may be conjectured from the preceding history of the disorder, and from comparing it with other diseases, as also from the few instances which have been attended with a happy event, it seems chiefly to consist in an affection of the nerves, which most nearly resembles convulsions, which occupy the viscera and the vessels thereof; whence arises a disorder in the blood and humours, which is not unlike a gangrenous inflammation. The seat of the disease is chiefly about the stomach and neighbouring parts.

The preventive cure consists in making deep scarifications, as soon as possible after the bite, in the part affected, and thence adjacent to it; that they make a considerable discharge of blood, and apply large cupping-glasses thereon; or it may be burnt pretty deep with an actual cautery. Then it should be made to suppurate by some corrosive application proper for that purpose; and during all that time it should be continually fomented with a pickle made with vinegar and salt: this should be continued for six months at least. The garments he had on at the time of the bite should be cautiously laid aside or destroyed. He should likewise with all convenient speed be dipped in a river, or the sea, making him believe that he is going to be drowned. This is to be often repeated; for the effect consists in terrifying the mind, not in the fatal water, as we have learnt from experience. Then he should also be often and strongly purged with rhubarb, aperic, and the juice of elder-bark.

The patient should also be put into a sweat every morning fasting, with a mixture of aromatic vinegar, tea-salt, and hot water. His feet and hands should also be daily fomented in a warm bath; and he should wash his head, mouth, and face.

Let him often drink cold water, and throw it up again by vomiting; and let his drink be acidulated. His aliment should be moist, light, and laxative, and often taken in such a quantity as to vomit it up again. He should likewise abstain from things that are too spicy, from wine, from heating things, from violent exercise, and from commotions of the mind.

The cure should be attempted when the disease is in the first degree, and in the beginning of the second, by treating it as highly inflammatory, by letting blood from a large orifice even to a deliquium, by giving clysters soon after with nitrous or moderately salt water.

After this let the patient be blind-folded, and thrown into a pond of cold water; or let cold water be thrown upon him till the dread of it almost ceases; then let a large quantity be forced down his throat: let this be his treatment daily, and at night let sleep be procured. And this method is better than that pernicious one of giving him the most acid heating and drying medicines; which exasperate the nervous system, and are in this case as bad as poison, to a patient already almost parched with heat.

Celsus informs us, that it was the practice of old to put the patient bit by a mad dog into a bath, and there to let him sweat as long as his strength will permit, at the same time keeping the wound open, that the virus might be discharged from it; and then to give him plenty of good generous wine. This being done for three days, they judged him out of danger.

This may give some light into the nature of the pulvis antiysius published by Dr. Mead, and received into the dispensatory of the college, wherein pepper is one of the ingredients:

1. Take four drams of ash-coloured ground liver-wort, and two drams of black pepper, beat into a powder.

This is to be divided into four doses, whereof one to be taken in warm milk in a morning, fasting, for four mornings successively. After this he is to be put into a cold bath, pond, or river, for thirty days together, early in the morning before breakfast.

Another famous specific is the East-india medicine; which is doubtless an egregious antispasmodic, and is as follows:

2. Take native and factitious cinnabar, of each 24 grains, and 16 grains of musk. Make them into a powder.

This is to be taken in a tea-cup full of arrac or brandy, and is said to secure the patient for thirty days, at the expiration of which it is to be repeated; but, if he has any symptoms of the disease, it must be repeated in three hours, which is said to be sufficient for a cure.

Dr. Wall of Worcester has found two doses of musk, of xy grains each, to produce very happy effects on two persons labouring under a fibulitus tendonum, with extreme anxiety, and want of sleep, from the bite of a mad dog; for it perfectly relieved them from their complaints. We have a singular case of a woman actually seized with an hydroprobia, given by Dr. Nugent; who was cured. He ordered this powder to be taken in honey every three hours, after she had lost 15 ounces of blood, and a pill of 2 grains of pure opium along with the powder, till rest was procured.

Of Poisons.

There are three essential marks of poisons which distinguish them from other things that are noxious to human bodies. The first is, that they consist of most subtle parts, and consequently are pernicious in a small quantity. The second, that they pervert, in a short time, the regular motions of the solids and fluids throughout the body, and induce the most grievous symptoms, even death itself. And the third, that they exercise their cruelty on the most subtle fluid, and the most nervous parts.

All the three kingdoms have poisons peculiar to themselves; but the animal kingdom affords the most subtle, which are communicated by the bite of mad or venomous.
MEDICINE.

The bite of a Rattle-Snake, hitherto looked upon as a most terrible accident, may now be cured in a simple, easy manner. It is the invention of a negro; for the discovery of which, he had his freedom purchased, and an hundred pounds per annum settled upon him during his life by the general assembly of Carolina.

Take of the roots of plantain and horseradish (in the summer the roots and branches together) a sufficient quantity; bruise them in a mortar, and squeeze out the juice, of which give as soon as possible one large spoonful; if the patient be swelled, you must force it down his throat. This generally will cure; but, if he finds no relief in an hour after, you may give another spoonful, which never fails.

If the roots are dried, they must be moistened with a little water. To the wound may be applied a leaf of good tobacco moistened with rum.

The mineral kingdom furnishes very few real poisons: the only natural one is cobalt; the factitious are arsene, corrosive sublimate, and glafs of antimony.

Cobalt is a kind of a marcasite, which is found in great plenty in the mines of Millina; and is well known for its poisonous quality, so fatal to insects, brutes, and men. In making the blue glafs, or enamel, called smalt, from this mineral, a sort of white flowers arifes, which, being melted in a stronger fire, is called white arsene. If this be melted again with an eleventh part of sulphur, it becomes yellow arsene, and, with a sixth part of sulphur, red. Of these, the white is the most deadly poison.

As for the true mineral poisons, they were entirely unknown to the ancients; for they reckoned quicksilver, crude antimony, all kinds of vitriol as well as cersus, and the laps lazuli, in that class; but orpiment, which they called arseneick, as Celsus testifies, and looked upon as a poison, is void of all virulence and deleterious qualities; and sandarach they termed red arsene, which is made of melted orpiment, but is no more noxious than the former. Indeed, it must be owned, that the above catalogue are not altogether friendly to human nature, or may be endued with a corroding quality; but they want the true characteristic of poisons.

Quicksilver, dissolvd in acid mineral spirits, is Likewise a poison, though of itself it is entirely innocent. This has chiefly appeared from errors in practice, when the mercury has not been rightly prepared and corrected.

Likewise glafs of antimony reduced into powder, and exhibited, causes enormous vomiting, with most cruel gripings, which often end in death.

Arsene, taken inwardly, creates a pricking, vellicating, irritating, burning sensation, with a heat and most violent pain in the flamach, a racking torture in the bowels, vomiting, unquenchable thirst, a roughness and dryness of the tongue, saucers and gullet, with hiccups: then follow most cruel anxieties, palpitation of the heart; fainting, coldness of the extremities; sometimes black vomits, and fluids with a fetid cadaverous smell; a gangrene and mortification of the flamach and intestines, which either in death.

Milk is very useful against all corrosive poisons, by its soft, oleous contexture, blunting their acrimony; and is a good vehicle to bring them up by vomit.
In all cases where a person is suspected to have been poisoned by swallowing any substance of a corrosive nature, oil with milk for a vehicle yields the most certain relief; and even when acid mineral spirits are taken by mistake, they will blunt or hatch the acrimony sooner than fixed salts and tannaceous powder will change their nature: besides, fallad-oil is generally at hand in all places as a decoction of barley with raisins, or a decoction of china-root, saffrafas, cinnamon, wood-lace, either in infusion or powder; the juice of wood-lace newly expressed, and taken for some weeks, increasing the dose, is of excellent use; as likewise mercurials, taken in very small doses, and a long while together.

If it arises from a suppression of usual hemorrhages, they are to be restored; but, if this cannot be done, artificial bleeding is to be substituted.

Externally, issues are held to be good, clysters and fections, especially in the phlegmatic. The eyes may be washed with fennel, valerian, eye-bright, or rofe-water, spirit of wine, Hungary water, and sal-volatile oleofum diluted, or an infusion of fennel-seeds in wine, with bags of strengthening herbs and fennel-seeds often put thereon. Sneezeing powders may likewise be proper, especially florentine orice, or horse chechefuts; likewise spirits of hart-horn, or sal-volatile oleofum, may be applied to the nose.

In all disorders of the eyes, but particularly in this, the body must always be kept open, that the humours may be inveterate, ripe, or perfect, as the rudiments of a cataract. But, if these have no effect, and the cataract grows inveterate, ripe, or perfect, it is to be depressed; for which, see Surgery.

Of a Glaucoma.

A Glaucoma is a change of the crystalline humour into an azure colour, from its dryness and conflagration, as some affirm; but Heister says, it arises from an opacity of the vitreous humour, which becomes of a whitish green colour; for, in a suffusion, an opaque body is placed behind the pupil, or is next to the aqueous part.

Sennertus says, this malady is known from a very remarkable whitenss appearing in the eyes, and lying deep behind the pupil, and all things are seen as through a smoke or cloud; it is said to be incurable.
Of the Amblyopia, or Obscurity of Sight.

The amblyopia is an obscurity of sight, and is four-fold: myopia, or short-sightedness; presbyopia, or seeing only at too great a distance; nyctaliopia, or seeing only in the night; amaurosis, of which before.

Myopia proceeds from the too great convexity of the cornea, or crystalline humour, or from the eyes being larger than common, as we learn from optics. This is best fold: myopia, or short-sightedness; presbyopia, or seeing only at too great a distance; myopia, or short-sightedness; presbyopia, or seeing only at too great a distance; nyctaliopia, or seeing only in the night; amaurosis, of which before.

The presbyopia may likewise be assisted by cephalic and strengthening medicines, by watery and vinous infusions, and comforting eye-waters.

Of a Strabismus, or Squinting.

A Strabismus, commonly called squinting, is an unequal contraction of the muscles of the eye, either from a fall, an epilepsy, or a palsy, whereby the axis of the pupil is drawn towards the nose, temples, forehead, or cheeks; so that the person cannot behold an object directly. Infants readily contract this distemper, sometimes for want of care in the nurses, who place the cradles in a wrong position, with regard to the light. Children likewise, while growing up, sometimes fall into this disorder, either from all customs contracted in playing, or by looking on others who are affected with it.

This disorder is very difficult to cure, therefore the utmost care should be taken to prevent it, and the cradle should be so placed, as not to occasion the child to look awry. Against it is contrived a mock, and so adapted to the face, that nothing could be seen except through two holes straight forward; and for the same purpose what we call goggles are used.

Of the Albugo, or Spot in the Eye.

An Albugo, or leucosis, is a whitish spot of the transparent cornea; the broader and thicker it is, the more it obscures the sight; when it is superficial, it appears the whiter; and, when it is deep rooted, it tends to blackness, and is scarce curable. That which is in reality a cicatrix, or scar, left after a wound or ulcer in the eye, is very difficult to be disfigured; that which follows an inflammation of the eye often goes away of its own accord.

It may be distinguished from a cicatrix, because this is of a thinning white and without pain; whereas the albugo looks like chalk, is attended with a slight fluxion, and some degree of an inflammation with pain. It is generally the forerunner of an ulcer.

The intentions of cure are answered by emollients, roylewents, and difcutients, which must be used with great care: and, if they fail, we may proceed to stronger.

Of a Sanguillation, or Bloodshot Eye.

A Sanguillation first appears of a reddish colour, and afterwards livid or black. It is caused by a stroke or fall, or violent vomiting, whereby the blood is extravasated in the coats of the eye. If the cornea is affected very much, all objects appear of a reddish colour; for some veins run to the cornea, in the part towards the iris, or the blood may be poured out into it from the neighbouring vessels.

If the disorder is great, there will be occasion for bleeding and purging, for the granulated blood in the fuggitation is to be resolved and disfigured, which may be done by difcutients, such as juice of fenon, with balm of Peru, juice of celandine, simple honey-water, mixed with other eye-waters.

If from this or any other cause there should happen to be an ulcer of the eye, Demours recommends coarse sugar as a good ingredient for deterging those of the cornea, in which adstringents are hurtful; but it must be mixed with collyria. When the aqueous humour of the eye is evacuated at a wound or ulcer of the cornea, he exposes the patient to the light, from time to time, till the cornea is again raised by the aqueous humour; for the light occasions a motion in the iris, which may prevent its adhesion to the cornea.

Of the Epiphora, or Lippitude of the Eyes.

An epiphora is a defluxion of a salt sharp humour upon the eyes, attended with itching, pain, and redness; as also a dimness of sight. It is but light when there is no defect in the bulb of the eye, when the eye-lids swell and look red, when the matter of the fluxion is thick and sometimes glues the eye-lids together in the night, continuing in this state for some time.

Children are often afflicted with this disease, particularly those who have had scald-head improperly cured; or who have swellings in the glands of the neck or about the ears, and then it cannot be cured until these tumours are diffused. It sometimes likewise succeeds the small-pox and measles.

The seat of this disease is in the glands of the eye, especially in those called the lachrymal glands.

This disease may be certainly cured in the beginning, by a plentiful drinking the infusion of the leaves of veronica, in the manner of tea, for some time. When it is inveterate, the patient must be very regular in his diet, and must avoid every thing salt, sharp, acid, wine, strong beer, and drugs. His common drink may be a decoction of barthorn and fennel seeds, using warm pediluvia at night going to bed.

Externally a grain of vitriol may be mixed with unsalted butter, to which a small portion of sugar of lead may be added and put into the greater corner of the eye. This is a most useful medicine. When the lippitude is of the dry kind, all acid applications must be avoided, and the eyes must be covered with a poultice of white bread.
bread and milk, with a little saffron mixed with it. The
success of feins and issues is uncertain, but a perpetual
blister on the neck is of great service. But it
must be continued for a considerable time.

Of the Fistula Lachrymalis.
The fistula lachrymalis is a disease which attacks the
great caruncle in the inward corner of the eye, and
stopping up the natural passage of the tears, forces them
to run down the cheek: but this is the first degree of the
disease. The second is, when pus is mixed with the
tears, which proceeds sometimes from an opening in the
skin between the nose and the great corner of the eye,
The laff is, when the pus has not only corroded the neigh-
bouring parts which are soft, but has affected the bone
which lies underneath. This sort of fistula sometimes
turns cancerous; and Riverius advises not to meddle with
it at all.

Whatever may be the cause of this disorder, whether
the small-pox or the French disease, it always stops up the
nasal conduit, which is opened by an operation. See
Surgery.

Of Deafness.
The causes of deafness are a cutting off the external
ear, or an obstruction of the auditory passage from wax
or other things; from a rupture of the membrane of the
tympanum, or when it is corroded or ulcerated, or the
auditory nerve is obstructed or compressed. External
causes are, falls from high places, excessive noise, such as
the explosion of cannon; likewise acute disorders near
their state, which are like to terminate by a critical ha-
emorrhage.

As to the prognostics, those who are born deaf are
rarely cured. A real deafness is hard to remedy. A
deafness in acute diseases, with crude urine, foretells a
delirium; but, when the signs of coddion are good, it
portends a critical haemorrhage.

With regard to the cure; if the obstruction be in the
external cavity of the ear, it is discernible by the sight.
If there is occasion to syringe the ear, a decoction of fage
and rosemary-flowers will be proper, with equal parts of
water and white-wine; but great caution should be used.
Some pump the head with warm bath waters. Some
say, the eggs of ants bruised and put into the ear, with
the juice of an onion, cure the most inveterate deafness.
Others affirm, that a salivation will sometimes perform a
cure.

A critical deafness will cease of itself. Etmüller re-
commends amber and musk.

Hoffman says, deafness sometimes arises from a slack-
ness of the auditory nerves, which often happens from too
great a humidity, which, if neglected, will terminate in
a perpetual and incurable deafness, and may be dispersed,
if taken in time, by proper cephalics and sudorifics.
Some for this purpose recommend equal parts of spirit of
lavender and hungary water, which should be drop warm
into the ear. Lindanus advises the gall of an eel mixed
with spirit of wine; and others, the fumes of sulphur
conveyed into the ear, with a pipe or funnel. But regard
must be had to the cause, if discoverable.

Of a Tinnitus, or Noise in the Ears.
Hoffman observes, that this is caused by the spasms
of the coats of the ear, which line the inward parts,
such as the labyrinth, cornea, and auditory passage, which
is often attended with intolerable anxiety.

The cure is to be performed, says Heißer, by temper-
ate diaphoretic powders, and resolving essences, com-
monly called antitachrales; as of amber, the woods,
rosemary; together with diaphoretics and alexipharmacs,
taken often in a day, with tea of betony, with rosemery
flowers, fage, or lavender and saffraffas. In the morning,
and at noon, the essences are to be taken; and at night
the powders.

Outwardly, essence of amber may be applied, either
evening; or a grain or two of amber and musk, or
calvator in cotton, either alone or with Peruvian balsam;
or carminative oils, such as anise, fennel, caraways, or
camom; not neglecting pediluvia, and frequent rubbing
of the feet and head.

Of a Coryza, or Catarrh of the Nose.
A Coryza is too great a moisturer of the nose, by a
thin sharp serum, which gradually becomes thick, and
sometimes coloured.

The cause of this disorder proceeds from the lymph
and mafs of blood, most commonly in the winter-time,
which hurts the nostrils; at first it arises from a thin,
sharp humour, which excoriates the parts, which, beco-
ming more thick, almost stops the nostrils and hinders
breathing. Sometimes it arises from irritants too often
taken, and from mineral fumes; this is accompanied with
spitting and a cough. Sometimes the effluvia, affecting
the nostrils, have the nature of a ferment, and become
infectious.

As to the prognostics, it is without danger, unless the
lymph is exceeding sharp and ulcerates the nostrils, and
so degenerates into an ozaena, or forsid ulcer of the
nostrils. Hoffman says, this excretion is often salutary,
and is exasperated by purges.

With regard to the cure, the irritation is to be stopped
in the beginning, by joining laxatives with sudorifics, ac-
cording to the condition of the patient, the season of the
year, and the reigning diseases. To stop the irritation,
oil of aniseed is very proper; but if the nostrils are red,
painful, and excoriated, it must be mixed with barley-
flour well dried. Camphor dissolved in oil of almonds is
likewise good externally applied, and the smell of horns
when rasped, as well as the vapours of gum-anime, re-
cived into the mouth and nose. The vapours of amber,
frankincence, myrrh, and benjamin, are likewise useful.
A coagulation of the mucus may be evacuated by distilled
oil of marjoram, amber and aniseed, mixed with leaves of
marjoram, and made into snuff; or, by a fynurnatory of
calcined white vitriol, twelve grains of which may be
mixed with two ounces of marjoram water, and filtrated.
If the nostrils are obstructed, the vapour of vinegar upon
hot iron will be profitable. If the head is heavy and dull,
the vertex should be anointed with balsam of Peru, which
may
may be made stronger with oil of amber. To preserve the mouth, troches may be held therein, made with mithridate and obisnum.

To preserve the fauces and windpipe, it is common to take raisins steeped in spirit of anisefd.

Of the Ozena.

The ozena is a forbid ulcer affecting the noftrils; wherein the humour is very acid or corrosive, intolerably fted, faniouf, and often mixed with a bloody mucus.

With regard to the cure, the leaves of tobacco, or tobacco ointment, are very useful: If it gathers to a crust, it may be removed by oil of sweet almonds. Some make use of the fumes of cinnabar, or inject mercurius dulcis; others use precipitate mixed with an emollient ointment, and applied with tents. Some use an injection of oil of sweet almonds, an ounce and a dram of oil of catoor to soften the acrimony of the humours. If the pain be great, they add a scruple of camphor and faffron, with half a scruple of opium. To take away the crust, they make a powder of rofemary and lavender fowers, dried lemon-peel, and commifi fruitt.

When the matter is well digested, the running abated, and the pain gone, it may be made stronger with lotions, and washed with warm milk.

Of Watching.

Watching is produced by too great a determination of the nervous fluid to the organs of the fenses: from its too great influence in the brain, while the lower parts are obftreced with colds or other causes, as in hypochondriac, melancholic, and mad patients, whose lower parts are cold: by any irritatng body, in whatsoever part it is placed, which disturbs the fenses, and efpecially the brain: from too great a motion of the humours, while the passages of the brain are open: from disorders, in which the caufes above-mentioned are predominant: as fevers, phrensy, melancholy, pains, suppurations, and fuch-like disorders.

When the caufe is known, it must be removed, if poiffible; and the irritatng spirits must be appeafed with emollitions, especially of poppy feed, or with the thebaic tincture, or theriaca and other opiates in general, nor neglecting the original difeafes. In fevers, a moift foftening diet is beneficial: as also preparations of barley, emollitions of poppy-feeds, and almonds, decoction of corzoner roots, almond cream, and winter flummery, used as aliment; likewife tea made of cowflip-flowers, and gentle laxatives. When the patient is reflelfed and wakeful the night before a crisis, no hypnoftics fhould be given.

When there is no other difeafe, the patient fhould have all care, and intenfe thinking, efpecially in the evening; he fhould ufe exercife, and eat light fuppers. If it is caufed by pains, they fhould be appeafed by antifpafmodics, things which temperate, and diaphoretics: if these will not do, mild opiates muft be added. In old perflons, all care and folicitude fhould be banifhed, the mind fhould be quiet, and the moderate ufe of generous wine may be allowed in the evening; likewife medi-

Of the Syncope, or Fainting.

Heister obferves, that this disorder may arise from want of strength from profufe bleeding, from fpasms and violent terror and dread, or from the flight of any greatly affecting thing. The patient is deprived of fenfe and motion, either wholly or in part, with paleneff of the face, and a very weak or low pulfe. They are generally roufed by fhaeking and pulling, or by volatile medicines; which diftinguifhes it from the apoplexy.

There are two kinds; the one flight, the other grievous. The flight kind is attended with paleneff of the face, difturbed vision, finging of the ears, and sometimes with a vertigo; the strength fails, and the patient is almost deprived of fenfe, falls or sinks down, till fome proper remedy is applied to the nofe and mouth. The more grievous fort is," when the patient falls into a delirium, and is deprived of all fenfe and motion, except breathing, and a very small pulfe; but yet he may be rouzed by spirituous medicines and other means, much more easily than in the apoplexy.

Besides the caufes already mentioned, there may be added the hyfpernic passion, which feems to proceed from fpasms; fome of this fort are thus affected with the smell of sweet things. Some incur this disorder by deep study, great inanitions, and fafting.

With regard to the prognoftics, it has generally more terror than danger attending it, unless it proceeds from profufe bleeding, or wounds, or a lefe of strength by other.
medicines have been used according to the diversity of causes, as vitriol, are applied to stop the blood, the cure must be when the nerves are hurt, or when sharp things, such as when persons are neither open his mouth, nor eat, as when persons are wounded, and something foreign is lodged therein, or when the nerves are hurt, or when sharp things, such as vitriol, are applied to stop the blood, the cure must be performed according to the diversity of causes, as particularly treated of in surgery. But when this happens spontaneously in infants, they generally die, though the best nervous and antispasmodic medicines have been used both inwardly and outwardly.

Of the Spasm of the Lower Jaw.

In the spasm of the lower jaw, when the patient can neither open his mouth, nor eat, as when persons are wounded, and something foreign is lodged therein, or when the nerves are hurt, or when sharp things, such as vitriol, are applied to stop the blood, the cure must be performed according to the diversity of causes, as particularly treated of in surgery. But when this happens spontaneously in infants, they generally die, though the best nervous and antispasmodic medicines have been used both inwardly and outwardly.

Of the Cynic Spasm, or Convulsion of the Muscles of the Mouth.

A Cynic spasm, if it proceeds from vegetable poisons, as it generally does, they are to be expelled immediately from the body by a vomit, and then giving generous wine, warm with ginger or pepper. If it happens from other causes, it must be treated with antispasmodics and nervous medicines, both inwardly and outwardly; and chiefly with piaffer of betony and bay-berries, prepared with oil of amber, and applied to the temples, and behind the ears.

Of the Palpitation of the Heart.

The heart often palpitates so much as to be heard at a distance by the bystanders, which they suppose to be an affection of the thorax. This may sometimes happen, from a violent motion of the body, chiefly when ascending high places, and principally in those who are plethoric and hypochondriac. Sometimes it is caused by fear or dread, when the blood is forced too violently to the heart. When it proceeds from violent motion or terror, and returns often, it causes a kind of polypus, as is evident from the distension of those bodies who have died of this disease. Hence, almost a continual palpitation arises. Sometimes it proceeds from a bad conformation of the heart and the neighbouring vessels, such as an aneurism of the aorta, when it becomes hony.

Others affirm, it sometimes may be caused by wounds in the ventricles or abscences in the heart; or from wind, or a disorder of the animal spirits, inducing spasmodic affections.

In the beginning of the cure, if the patient is plethoric, or when usual bleedings have been stoped, it will be proper to bleed, by way of prevension, in the spring and autumn.

Besides this, saline, nitrous, and cinnaabarine tempering medicines are to be used, particularly antispasmodics, to appease the motion of the heart, and render the blood more fluid. The aqueous infusions of tea, balm, veronica, primroses, or citrons, are likewise proper, especially with the essence of scorndum, cardius benedictus, curion, or orange-peel, with a little dulciified spirit of nitre, taken morning and evening; as also temperate and diluvia, moderate frequent exercise, riding, moderate diet, plenty of thin drink, whey, mineral waters, especially the chalybeate kind, are very useful in this disease.

Of a Polypus of the Heart.

A Polypus is a mass composed of various pellicles and fibres, generated in the heart and large vessels. They are generally founded in acute as well as chronic diseases; and there are few bodies to be met with, wherein they are not to be found after death. Its principal seat is in the heart, pulmonary artery, and the aorta.

They principally attack the sanguine constitutions, and patients who have smaller vessels, soft fibres, of a sedentary life, who drink little, or are free in the use of acid wines and spirituous liquors, as also those who eat large suppers.

The beginning of a polypus may be known by a compression of the breast, a fixed pain about the heart, and when it increases there is a frequent palpitation of the heart, from a slight cause, and the pulse is strangely unequal and often intermits. When there is a violent motion of the body, the patient has taken a medicine which disturbs the blood, or the mind is violently affected, a shortness of breath and an incredible anxiety of the heart will arise. Lastly, there are frequent faintings without any evident cause, or from a certain position of the body. If the blood is let fall into hot water, it will congeal like jelly, and cleave into white filaments.

In the cure, an exact regimen and diet must be made use of, with a frequent exercise and motion of the body, and mineral waters, especially those of the chalybeate kind, and abounding with alkalious salt.

Of the Hiccup.

A Hiccup is a spasmolic affection of the stomach and diaphragm, arising from any thing that irritates andvellicates their nervous coats. When it proceeds from a slight error in diet, it will soon end spontaneously, or by drinking any thing which dilutes the acrid matter. Sometimes
it is of a more grievous kind, and may proceed from a hurt of the stomach, poison, an inflammation of the stomach, intestines, bladder, diaphragm, or the rest of the viscera. Sometimes, immediately before death, it may proceed from gangrenes of the outward parts. In acute fevers, and chiefly the malignant, a hiccup is frequent, and often fatal.

When it happens in old or weak persons, from a plentiful meal, especially from hard and flatulent aliment, a draught of generous wine, or a dram of any spirituous liquor, will generally take it away. Likewise stomachic powders mixt with Peruvian bark, and taken in generous wine, are profitable; as also if it proceeds from cold, or drinking cold liquors.

When it proceeds from other causes, especially from acid humours in the stomach, absorbent and alkalious medicines are good. If it proceeds from an acute fever, or an inflammation of the stomach, it is a dangerous disease. However, dulcified spirit of nitre, joined to an apharmacès, and given often, is proper; a dram or two of diasordium, given in the evening, may perform a cure. If it proceeds from a gangrene or mortification, it is generally incurable: but Peruvian bark, with medicines against internal inflammations, is most likely to succeed.

If a poison is the cause, plenty of milk must be taken with oil, as has been already taught.

Of the Soda, or Heart-burn.

This disorder is a heat or troublesome burning about the pit of the stomach, or its left orifice, which sometimes is extended the whole length of the oesophagus, with a pressure or spasmodic constriction, usually attacking the patient by fits. The caufe is generally hot aliment, if cold drink be taken soon after. In some it proceeds from acids, in others from aromatics, spirituous liquors, or bilious humours. It frequently torments pregnant women. This disorder is generally slight, and vanishes of its own accord; but in some it is of long duration.

In the cure, the caufe must always be attended to: If from acids, absorbents are proper, particularly crabs-eyes and prepared shrubs, mixed with a fourth or fifth part of powder of nutmeg, given to half a dram. It is common to take chalk alone, or mixed with nutmeg; but care should be taken not to be too free in its use. Oil of tartar per deliquium, given from 20 to 30 drops, in tea, coffee, broth, or warm beer, is usually efficacious; as also tincture of tartar and spirit of hartshorn. If it proceeds from bilious humours, 30 or 50 drops of dulcified spirit of nitre in water, tea, or coffee, will take away the pain. When it is caused by hot things, and draughts of cold liquor, a dram of brandy is good. Now and then laxatives should be given, to carry of the humours. In sanguine constitutions, bleeding may be proper.

Of the Cardialgia, or Pain of the Stomach.

Of all pains of the stomach, the cardialgia is the most severe. It is a spasmodic pain of the orifice of the stomach; sometimes of the right and sometimes of the left. One kind of this disorder may proceed from a sharp caustic, or poisonous matter; sometimes it arises from a redundant or caustic boil, or from a dysentery. At other times it may proceed from the blood, when any usual evacuations are suppressed, and the nervous membranes of the stomach are dilated thereby. Hence it often happens to women after the fiftieth year; and, in the cure, bleeding or scarifications are proper: on the other hand, if it is deduced from a caustic matter in the stomach, oily appeasing things, affes milk, an infusion of camomile flowers, cream, with absorbents, are proper. It must be distinguished from a painful inflammation of the stomach, in which there is a tumour like a bladder under the false ribs, chiefly on the left side, and under the pit of the stomach; but the inflammation is generally on the right side, with great difficulty of breathing. This is common in infants before they are weaned; but more so in hypochondriacs, if they are too luxurious.

If it proceeds from the remains of the aliment grown sharp, whence flatulencies arise, it generally gives way to tea or coffee alone, or a decoction of camomile flowers, especially mixed with stomachics; likewise preparations of fennel, anise, orange peel, and other carminatives are useful; as also a dram of the powder of orange peel, or camomile-flowers, with a few grains of saffron, in an ounce or two of wine.

When the stomach is too much filled with aliment difficult of digestion, or fat things, a gentle emetic will be necessary, especially if there is a naufea or reaching to vomit; after which, a sufficient quantity of warm water must be drank, to wash the stomach: this will be best promoted with a decoction of carduous benedictus, or half a dram of tartar-vitriolate, salt of worm-wood, and the like; after which stomachics must be given.

In a very violent cardialgia, from congestions of blood, vomits are improper, but bleeding necessary, with anti-spasmodics of tartar-vitriolate, nitre, cinnabar, crabs eyes, and the like, in a proper vehicle; as also spirit of hartshorn mixt with tincture of tartar to 50 or 60 drops. To these may be added emollient and anodyne clysters, and a bladder of hot milk, with camomile flowers, applied to the pit of the stomach.

Of Flatulencies and Eructations.

The cause of these disorders is generally a weak stomach, and crude flatulent aliment, such as peas, beans, lentils, coleworts, turnips, radishes, hard fat flesh, and the like; which degenerate into wind, creating great anxiety, if not evacuated, and difficulty of breathing. It is a disorder familiar to hypochondriacs, and the stomach being strongly contracted, the wind breaks out with violence.

Another cause of flatulencies are congestions of blood in the branches of the vena portae; whence proceed anxieters of the pavis cordia, difficult breathing, colic pains, and the cardialgia, and, by confluence of the stomach with the head, pains in the head, the vertigo, and watchfulness. If it arises from eructations in the stomach, evacuations are necessary first of all; and then strengtheners, aromatics, bitters, and carminatives, such as have been mentioned in the preceding discharges, with a sparing diet, and exercise.

If it proceeds from congestions of the blood in the branches of the vena portae, which is the case of hypochondriacs, or when usual bleedings are suppressed, a vein:—
WORMS are various with respect to their shape and magnitude; and their seat is in the stomach and intestines. The round are furnished with a proboscis, and a kind of crooked claws, wherefore they sometimes gnaw and tear the membranes. If these lodge in the stomach, their bites are attended with an inexplicable pain, anxiety, indigestion, nauséa, and flux of spittle; a fetid smell exhales from the mouth; the countenance is now pale, and then red; there is an itching of the nostrils, with an inclination to vomit, and a dry and troublesome cough by fits, and sometimes fainting.

When they are contained in the intestines, especially in infants, and they seem to be affisted with the tympany, with now and then a diarrhoea, and the faeces are of an asti-colour, not red; there is an itching of the nose, with an inclination to vomit, and a dry and troublesome cough by fits, and sometimes fainting.

The powder of tin has been used many years as a remedy against worms, and particularly the flat kind which often elude the force of other medicines; but the success of this depends upon the proper dose, and then it will have remarkable effects.

Take an ounce and a half of pewter, and grind it to a fine powder, and mix it with half a pint of treacle.

To adults give two ounces of the powder of pure tin, sifted through the finest hair sieve, mix it with eight ounces of treacle, after the patient has been purged with an infusion of fenam and manna.

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D O F D I F F I C U L T Y O R S U P P R E S S I O N O F U R I N E.

Difficulty of urine arises generally from a stone, or from an inflammation of the kidneys or the neck of the bladder. In sanguine persons, it may proceed from the suppression of some usual hemorrhage, or from the blind piles; or there may be a congestion of blood in the spunge or cavernous part of the urethra, which may be so distended and inflated, as not to transmit the urine, or at least with great difficulty. In some it may be owing to a spasm of the neck of the bladder, or to sharp urine; in others to a palsy of the bladder, or a caruncle of the urethra; or from a tumour, abscesses, or ulcer, in the prostate gland; or from its being too large, or indurated, as often happens. Likewise in bloody urine it is not seldom suppressed; at least it is expelled with great pain and trouble, which proceeds from a congestion of blood. Emöller affirms, that a dysuria is generally occasioned from the want of mucus of the urinary passage, or its being worn off.

As the causes of an ichury are various, they ought to be carefully distinguished from each other. When it proceeds from an inflammation of the kidneys, the pain and heat are principally in that region, attended with a fever; if from a stone in the kidneys, it is accompanied with vomiting; if from a stone in the bladder, there is a violent pain.
pain in the bladder, which is extended to the very extremity of the urethra; a mucous or pus is excreted with pale urine; and, upon proper examination, the stone may be felt; but the most certain sign is searching the bladder with a catheter. When this disorder arises from a stone in the urethra, it may be easily felt. If from an inflammation of the neck of the bladder, there is a tumour and pain in the peritoneum; but it may be felt perceived by throbbing the finger into the anus, and turning it up towards the bladder; for a tumour will be perceived by the physician, and by the patient a burning and pressing pain; and when a catheter is introduced into the urethra, an impediment will be felt near the neck of the bladder, which will hinder it from proceeding further. To these signs may be added, when the disorder is great, a tenesmus, a constrictiion of the anus, an anxiety of the praedicordia, coldness of the extreme parts, vomiting, and a freble pulse. When the cavernous substance of the urethra is too much distended with blood, and the urine is suppressed, a silver pipe cannot be admitted into the urethra, especially if the patient abounds with blood. When there is a spasm in the neck of the bladder, it appears from the causes aforesaid; and likewise the patient perceives a spasmmodic constringion about the neck of the bladder, and a catheter will pass thereto, but no farther; and there are no signs of a stone in the urethra or bladder.

If the urine is sharp, and produces a spasm, we may discover it from its being very flinking, especially if the patient is old or sebaceous; and there are many saline particles in the urine like lime. When there is a caruncle in the neck of the bladder, it may be known from the signs mentioned in the lues venerea, where the cure is treated of. An aboeel in the prostate gland often is mistaken for a caruncle. When a feirrus of the prostate gland is the cause of a supreflion, there is a hard or indolent tumour in the perineum, or at least the pain is not great.

When the urinary passages are obstructed by solid bodies, that is, the pelvis of the kidneys, the ureters, or the neck of the bladder, or the urethra, from a stone contained therein; if it be small, diuretics will be proper, which are mentioned in a fit of the gravel or done; to which may be added a decoction of eringo-root and Ephom salt or Selters waters taken often therewith. But if the stone is large, and cannot be excreted by this means, strong diuretics are highly hurtful, and must be cured by fection; (see Surgery.) But if the patient is too weak, or too old, and cannot undergo the operation, the stone, if possible, must be driven back; and the pains must be appeased with antispasmodics internally, and with lenients, lubricant and oily medicines, as well as gentle anodynes: Externally, with emollient clysters, ointments, liniments, and baths. If the pains are violent, lenient injections may be thrown up into the bladder, of falad, linseed, and white poppy oil, or oil of sweet almonds, or a decoction of linseed or roots of mallows in milk, with the addition of a little fresh butter. This done, the patient must have recourse to lime-water.

If the urine is suppreffed from an inflammation of the kidneys or bladder, diuretics are pernicious, and mineral waters not safe; but rather refrigerating nitrous remedies,
especially if the cafe is venereal. Then mineral waters
may be drank, either alone or with warm milk, for se-
veral weeks, or the hot bath waters: to these may be
added injections of a decoction of the traumatic herbs,
such as agrimony, St John's wort, plantain, or yarrow;
or, in their stead, milk with syrup of marsh-mallows, or
fresh butter, or oil of St John's wort.

If there is a difficulty of urine in pregnant women
towards the laft months, diuretics must be fhunned. The
best remedy in this cafe is to cafe the pressure upon
the part; but, if that will not do, to ufe a catheter.

Lastly, if it proceeds from a swelling of the proftate
 gland, or if it is become feirchous, it must be treated as
fuch, as will be hereafter taught.

But, if these remedies will not do, the bladder muft
be pierced with a trochar, which is called the puncture
of the perinaeum; and, when the perforation is made,
the water must be evacuated, as in the droify: The in-
strument muft be left in the wound, and be faftened in
such a manner that it does not fall out, that fo the urine
may be made as often as there is occafion: It is a trouble-
some operation, but the only one left.

Of the Diabetes.

A Diabetes happens when the urine comes away
crede, exceeding the quantity of liquids drank, attended
with weaknefs, which generally proceeds from the kid-
nels, which are too weak and lax, especially in thofe who
have been accuftomed to drink too much. Heift.

Liftier obferves, that a diabetes comes flowly on, and
is a long while in breeding. In the beginning, the mouth
is dry, and the fpittle a little white and frothy; the urine
being something more than usual, with a small thrill. A
heat begins to be perceived in the bowels, which is a little
punfent; the patient falls away, and the mind is anxious
and untable. In time the thrill greatly increafes, the
urine is plentiful, and the body waftes. When they
make water without intermiffion, the thrill becomes in-
tolerable; and, though much is drank, it is not proportion-
able to the water. When the urine is retained a little
while, there is a swelling of the loins, ilia, and teffes,
and it comes away with pain. Now death is at hand.
The urine is pale, not fweet, but it is more fweetish at
laft than at firft.

Strengtheners, moderate aftringents, and species of
hyacinth, with coccus maris, are good in this difeafe,
efpecially with anodynes: or Japan earth, or the tincture
of vitriol of mars, red wine with water in a small quan-
tity; the drink should be fparring, and all exceffes avoid-
ed. Exercise and frictions of the body are likewise prof-
bitable, becaufe they Strengthen the parts, and increafe
perpiration.

Liftier fays, almonds and a milk diet are proper in this
dilemper; as also wine with ginger; allowing in the mean
time a draught of milk and water to allay the thrill.

Wilfs declares, he has often prefcribed tincture of an-
timony with good success; and lime water with faflafra,
aufieeds, raifins, or liquorice.

Of the Chlorosis, or Green-Sickness.

Sydenham looks upon this to be a species of the hy-
feric affection, and is known by a paleness and discolora-
tion of the face and the whole body. The complexion
appears a little subluid or greenish, with a red or dark
circle under the eyes; the face is bloated, the eyelids and
ancles are apt to fwell; the whole body is heavy and dull;
there is a tenfive laffitude of the legs and feet, difficulty
of breathing, palpitation of the heart, pain of the head,
a feverifh pulse, a drowfinefs; a pica, or defire of eating
unfit things, fhuch as coals, chalk, &c. and a fuppreffion
of the menfes. The clavus hyftericus often attacks pa-
tients in the height of this disorder.

The cure is to be attempted with chalybeate medicines,
such as are prefcribed in the hyferic disorder, given ac-
cording to the patient's age, drinking wine after them;
or the correlorating infefion with angelifa root. If the
patient is not very weak, he may be purged once or twice
before the courfe is entered upon.

Heiftier recommends attendants, evacuants, and Streng-
heners, with a good diet and exercife; particularly from
v to vij grains of powder of feel, with half a scrupps of a
proper eliafaccharum, or with bitter extracts given in the
evening; as alfo emmenagogues at due times, with pe-
diluvia and bleeding in the foot about the time of men-
struation. If these will not fuffice, he thinks marriage
a certain cure.

Of the Suppression of the Menses.

As soon as a healthy female arrives at her full growth,
she generates more blood than can be conveniently con-
tained in the veffels; wherefore the superfluity is evacu-
ated by the uterine arteries, and is called the Menfes.

Boerhaave obferves, that in a fuppreffion of the men-
ifes there is a plethora, with a litleffnefs to motion; a heavi-
nefs, a paleness, a pain of the loins and of the groin;
all the functions, whether natural, vital, or animal, are
deprieved. Sometimes the menfes will force a way thro'
the eyes, ears, noftrils, gums, the falivial ducts, bladder,
breafes, skin, wounds, or ulcers.

Hence often arifes a depravation of all the viftera, as
alsoiffeafes without number, partly from a putrefaction
already begun, and partly from the hurt which the veffels
have received.

From this disorder proceed want of appetite; the pica
and malacia, or a depraved appetite. If it is habitual
and obfinate, a feirrus or dropfy of the womb are to be
feared, or a rupture of some blood-veffel, efcpecially of
the lungs. It is not fo dangerous when the uterus is not
infarfed, or when there is no other fymptom of the men-
ifes. If this difeafe is attended with the fluor albus, it
may become habitual, and from yellow become green and
acid, corroding the uterus, and laying a foundation of a
dropfy therein.

Things which retard the menfes are, immoderate cold,
sorrow, a fudden fright, too great evacuations, increafa-
ing
This disorder is to be cured in the same manner as the
ytic affection; but, if the remedies for that fail, the
patient must take every morning five spoonfuls of an hy-
tic julep, with twelve drops of spirit of hartshorn; and
every night a scruple of compound powder of myrrh made
into a bolus, or pills with syrup of lemons. Allen recom-
meds cantharides and camphor; the dose is from two
grains to fix.

Hoffman directs chalybeates, or pills made of aloes,
myrrh, saffron, amber, caltor, and round birthwort. Pit-
corn thinks mercury more efficacious than steel.

The cause may be referred to a copious and impetuous-
flux of blood to the uterus, and an unequal and im-
peded reflux by the veins; which diffusing and relaxing the
uterine vessels, make the orifices too wide, or rend and
corrode them, by which the blood flows too freely.
This may happen from a plethora, or when there has
been a long supposition, or an abortion, or a difficult la-
bour. It generally happens to women about the fiftieth
year, when the menes are going to leave them; and not
always without danger. It sometimes happens to women
upwards of sixty, which, if attended with a flow fever,
haunts death.

The concomitant signs are generally these: A tension
and inflation of the hypochondia, a heavy pressing pain
about the loins, sometimes with a chilnfs; a cold hs of
the extremities, a sinking of the veins, a paleness of
the face, a quiok pulse, with an internal heat, a coldive-
ufes, and little urine; all which fhew there is not only
a debility and laxity of the uterus, but fpasmotic fric-
tures of the vafcular and nervous parts, which force the
blood to the uterus.

If the body is cacochymic or scorbatic, or full of bad
humours, or afflicted with the venereal disease; when the
terica are unfound, and the liver, ffeen, and meferic
veins, are fuffed with thick blood, the cafe is dangerous
and troublesome; for the fault of the fluids and cachexy
continually increafe: Besides, the more the strength is
weakened, the more the morfhach and digestion are hurt;
the blood is depraved, and the excrementis disturbed and
leffened. When this happens to women when the child
is dead, their lives are in great danger, and nothing but
fpeditous affifance from a man-midwife can fave them. The
cafe is also dangerous when the fecondines are violently
extracted, or parts of them are retained, and which some-
times degenerates into moles.

Immoderate evacuations are produced by a fedentary
life, which gives room for abundance of thick chyle and
milk. It is caufed likewise by too frequent ufe of falt,
ae, and feafoned meats; by fpirituous liquors, &c. by
violent agitation and paffions of the mind, from loffes,
gaming, love, anger, &c. It may be obferved likewise,
that violent exercife does as much harm as the moderate
is serviceable, especially if the patient is subject to this
vex from other cafes; fuch as immoderate repetitions of
the venereal act, efpecially in women of a delicate confi-
uation; too frequent child-bearing.

The cure fhould refti the refraining a prefent flux,
and the keeping within bounds a future one.

It should be begun with reft, if convenient, in bed;
the patient lying on her back, and filent as much as pos-
fible. Bleed in the arm, according as the constitution and
strength of the patient, as well as the urgency of the
symptoms, will admit or require. Avoid ligatures of the
limbs. Let the patient fare flenderly on veal and chicken-
broths,
broths, 6th soups; and drink a pint of nettle-tops, yar-
row, and plantains, with orange-peel, or of the greater
comfrey; if he be hot and bilious, with linseed.
If these fail, have recourse to astringents.

Of the Fluor Albus, or Whites.

The fluor albus consists in the efflux of a whitish,
lymphatic, serous, or aqueous humour, from the matrix.
It is sometimes white, sometimes pale, yellow, green,
or blackish; sometimes it is sharp and corrosive, some-
times foul and fetid; the face is discoloured, there is a
pain in the spine of the back, the appetite is lost, and
the eyes and feet swell. Some women have a periodical
flux of whites instead of the menses.

The symptoms are, a pain and weight in the loins,
which is worst in the lymphatic flux, as being attended
with a swelling of the uterus, turrid urine, barremefs,
a proneness to abortion; a loathing of some things, and
longing for others; indigestion; thicknefs and crudity of
secretion becomes morbid, it is called the fluor albus.

At first the parts of the membrana adipofa of the loins,
and carry off all the fat of the body.

The fluor albus sometimes is discharged from the ute-
rine vesicles, and sometimes from the glands of the vagina:
at first it flow by day, and of the face by night; difficult breathing,
palpitation of the heart, syncope, relaxation of the liga-
ments of the heart, a total or partial procdentia uteri:
if the flux is acrid and corrosive, it ulcerates the vulva;
creates phlyctenae; which last generally proceed from a
scirrhus or cancer in the uterus; a fever fever; droplings
of different parts; of which, or a consumption, the patient
generally dies.

It may be known from a virulent gonorrhoea; because
this is attended with pain and an inflammation of the ex-
ternal parts of the pudenda, chiefly about the clitoris;
heat, sharpness and difficulty of urine, pain in coition;
it makes its progress sooner. If the gonorrhoea is inve-
ently confined to fewer objedts.

Besides arterial blood, the menses consist of redundant
lymph or serum, chiefly from the membranous cells, and
ventricles of the glands of thofe parts of the membrana
cellulofa which are more immediately connected with the
kidneys, uterus, and ovarium. When this lymphatic
secretion becomes morbid, it is called the fluor albus.

The parts of the membrana adipofa of the loins,
and carry off all the fat of the body.

Salacity in women, attended with impudence, refl-
lefsness, and a delirium, is called the furor uterinus.

It arises from a too great sensibility or inflammation
of the pudenda, or parts wherein the venereal stimulus
refides, which are chiefly the clitoris and vagina; or the
too great abundance and acrimony of the fluids of thofe
parts; or both these caufes may exift together.

In the delirium maniacum, the patient is entirely flame-
ufs; in the melancholicum more referred, and her folly
is confined to fewer objects.

When this flux is attended with a virulent gonorrhoea;
because this is attended with pain and an inflammation of the ex-
ternal parts of the pudenda, chiefly about the clitoris;
heat, sharpness and difficulty of urine, pain in coition;
it makes its progress sooner. If the gonorrhoea is inve-

The indications of cure, are to diminifh the heat and
feverilaty maniacum, than when the delirium is effential,
and the furor uterinus ensued.

It is difficult to cure in those whose menses are difficult
at first; in inveterate cafes; in old subjefts. It is easier
cured, when the furor uterinus is effential, and the deli-
rium symptomatic, than when the delirium is effential,
and the furor symptomatic. The maniccal delirium is
harder to manage than the melancholic. If it continues
a month or two, the fault of the brain becomes obli-
uate, for it degenerates into real madness.

The indications of cure, are to diminish the heat and
senifibility of the affected parts; to cool, sweeten, and
dilute the blood, and to render it bafmatic; or to pursue
both intentions at once.

The firft indication is answered by frequent and copious
bleedings, as in an incipient madness; even to eight times
in
Of an Inflammation of the Womb.

An inflammation of the uterus appears from extraordinary heat, and a fixed pain in the groin, with an acute fever, a pain in the loins and belly, an inflammation of the abdomen, a flux of pus and blood; heat, and difficulty of urine; tumour, pain, heat, and tension of the hypogastric region; redness of the os uteri, and great heat of the vagina. If the fore-part of the uterus is affected, there is a dysuria or heat of urine; if the back part, a tenesmus, frequenttings and cardialgia, a burning fever; or, if the inflammation is violent, a lypyinia, in which the external parts or extremities are cold, and the internal burn, and the pulse is imperceptible; a delirium and phrensy: the breasts swell in proportion as the inflamed uterus.

This disease may be said to be superficial or more grievous and profound. It is easy formed in child-bed women, and frequently accompanies the milk fever; and may be cured in a few days, if rightly managed: But when it is very intense, and attended with grievous symptoms without remission, it kills on the seventh, ninth, or eleventh day; and a white miliary fever generally supervenes, which is the worstomen, for it shows a mortification of the uterus. When this fever happens, there are spastic and painful strictures in the abdomen, the flux of the uterus is stopped, the body is coltive, the feet are cold; there is an urgeing to make water, which is painful; the head looks red, and swells; the eyes shine: drops of blood fall from the nose; the mind is disturbed; the sleep is little, with terrifying dreams: there is likewise a most difficult breathing, faintings, convulsions, a phrenetic delirium, which commonly have a fatal tendency.

This disease should be distinguished from an inflammation of the bladder or rectum; which may be done from the place of the pain: in that of the bladder it is superficial, as it were in the integuments; in that of the rectum it is very deep; as if about the os sacrum; in that of the uterus it is in the middle, with a violent heat in the vagina, if the finger is introduced. If the bladder is affected, there is an extraordinary heat and retention of urine; and a tenesmus, if in the rectum: In the bladder; the pain is precisely on the os pubis; in the rectum, the anus is affected. If these symptoms happen in an inflammation of the uterus, they are more flight. If the inflammation is not resolved, it generally ends in a mortification, ulcer, or cancer. A mortification four days, if nothing forbids; if the pains, there is no danger. She must likewise be purged, as mad folks are, with jalap, fcammony, diastiglid. The dose must be increased one third, as being hard to purge. A vomit may be gave on the third day; and then, if it is still retained, a vomit may be given on the fourth day, and is known by a weak, languishing, and intermitting pulse, and by a sudden cessation of all the symptoms.

A gangrene or mortification happens on the fourth or fifth day, and is known by a weak, languishing, and intermitting pulse, and by a sudden cessation of all the symptoms.

If the disease exceeds the time of the former terminations, and the inflammation is superficial, it is apt to turn into an induration or firrhous; which ulcerating, becomes a cancer, and is incurable. If, about the twenty second day, there is a renitency or hardness, and a dull heavy pain in the region of the uterus, there is a firrhous formed.

Women in child-bed sometimes have the womb inflamed from the fault of unskilful midwives, or hard labour; or the lochia are stopped by pains, or hysterical spasms, dread, or cold; wherefore proper precautions should be used to prevent it; which may be done by keeping them under a gentle diaphoretic regimen, and by allaying the almost febrile heat. Oil of almonds is proper alone, or with a fourth part of sperma ceti, given daily to half an ounce in chicken-broth; externally the whole abdomen should be anointed with oil of dill, camomile and white lilies, of each an ounce, oil of caraways a dram, or a dram of camphor; laying a warm napkin doubled over the fame.

The tumult being thus appeased, the lochia are to be promoted with pills of bitter extracts, temperate rhenatious gums, and aloes well corrected, of which xv gr. is a dose morning and evening, to be continued from five to eight days. These are also good when the after-birth or part of it is retained.

If there is a fever, the belly is diffended with wind, the lochia are retained, and the spasms tend to the upper parts, you must bleed in the foot.

The drink may be chicken-broth, with scorzonera root, fucory, and shavings of hartshorn boiled therein. As also temperating and resolving powders made of crabs-eyes, and their solution nitre, and fai polychrest. To which may be added clysters of whey, camomile-flowers, mug-wort, sedge, &c. with honey, nitre, and fat of hens.

In women out of child-bed the inflammation generally happens in the neck of the uterus and the vagina; and then, besides the foregoing things, you must apply episthmes to the pubes, uterine injections, peffaries, and fuppositories. The epithem may be of arquedebutic water four ounces, essence of saffron, camphorated spirit of wine, of each two ounces, nitre a dram, diffolved in elder-flow water; and, as circumstances require, mixed with vinegar, or rue, or fcorbim, and applied with a double cloth. The injection may confit of afeis milk, with flowers of elder-myrt, and saffron; and a little nitre may be added to the decoction. The tenesmus may be appeased with emollient half baths, or with an ounce of oil of sweet almonds, and xij grains of saffron, injected into the anus. These remedies are useful in case of a suppuration.
Of the Abscess of the Womb.

Abscesses of the womb are either inflammatory, tuberculous, or septicatus.

The symptoms of an incipient abscess are the same as the inflammation, such as pain, heat, tension, etc., which intermit for some time, and appear again, when the suppuration begins; of which the purulent is most fertile, the septicatus the least. When the abscess is formed, all the symptoms of inflammation vanish: but coldness of the extremities, a lowering of the fever, and marasmus, gradually increase from the absorption of the pus into the blood.

If no inflammation has preceded, and the patient was subject to obstructions, especially of the glands of the uterus, and had a lymphatic flour albus, it may be tuberculous; if the tumour is soft and indolent, it may be septicatus; but these are rare. The place may be partly covered by the touch, but more especially by the complaints of the patients.

If it breaks into the bladder, and passes off by urine, or into the rectum, and is discharged by fistula, or into the groin, it is dangerous; if into the abdomen, incurable.

If it breaks into the vagina, it may become an ulcer, which is commonly mortal; or the patient may perish by the symptoms of the poison.

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with a soft fungous flesh about the suture; you have the
progres to a confirmed cancer. The matter never be-
comes pus.

An ulcer of the uterus resembles a cancer, when a pu-
trid tances ulices from the corrupted fulbance of the womb,
with great vench, exquisite pain, and grievous symptoms.
This disease is almost incurable.

The principal symptom of a cancer is pain, which is
attended with reddiness, burning, indigestion; which
produce a low fever, consumption, marasmus, and the like.
A hard, renient, painful tumour, preceded by an in-
dolent scirrhus, plainly evinces the existence of a cancer.
If nothing is discharged by the uterus, but a limpid, pel-
ucid lymph, it is an occult cancer; if acrid serum, or
ichor, it is open.

There is nothing to be done in this case, but by demul-
cents and lenients. If there is any hope of cure, it must
be placed in foies milk, the Selters waters, and in bath-
ing in soft water wherein wheat-bran has been boiled;
in which the patient must fit for an hour, or longer. She
must abstain from all sharp, acrid, stimulating, and heating
things.

Of the Procidentia Uteri.

It is a common disorder; and the uterus presents it-
self in the vagina between the labia, or is quite visible.
Sometimes it is only the internal membrane of the vagina,
somtimes the body of the womb.

This disorder is rarely dangerous, for women bear it
a long time.

The cure consists in reducing the uterus, and retaining
it in its place. To reduce it, order a simple clyster to
evacuate the rectum; the patient should also bleed three
or four times; Then emollient cataplaams should be used
of white bread and milk, or of emollient plants; emol-
lient baths are also to be employed. The parts being
thus relaxed, the patient must lie on her back, with her
hips higher than her head, and her legs quite asunder;
then put back the uterus by degrees, where you find the
least resistance, and without any violence. This done,
the patient must be confined to her bed for about fifteen
days, with her thighs closed, or her legs acroos, and her
hips raised.

The cure must be completed with astringent injections,
baths, and pessaries; with emulsions of frankincense,
red roes, and maltich.

For Abortions, See Midwifery.

For Child-birth, See Midwifery.

Of CHILDRENS DISEASES.

Of Disorders from a Retention of the Meconium.

Infants newly born, from a retention of the meco-
num and other forbid matter in the prime vitre, are sub-
ject to gripings or pains in the belly, which produce con-
stant crying, hiccups, the jaundice, wakefulness, red-
leensfs. fallings, frights, convulsions, and epilepsies;
which, unless timely prevented, are fatal.

To carry this off, infants should suck the first milk of
their mother, if they give suck; otherwise they should

Of Disorders from Cordivenes and Wind.

If after some time the excrements become hard, with
cordivenes and a retention of wind, they will cause the
symptoms abovementioned. In this the same remedies
may be used, till the child's belly is open, and the acid
or corrupted milk should be corrected with absorbent
and tafaceous powders; whereof half a scruple is a dose.
Harris believes an acid to be so predominant in infants,
as to cause all their diseases. Boerhaave affirms, if ab-
portants are useful at any time, they must be in these cafes,
and orders vij grains of the tafaceous powders three times
a day.

The nurse must forbear to feed upon any thing that is
four or acid.

Of Watching, or Want of Sleep.

Want of sleep proceeds from the gripes, or coddive-
ens, and wind and pain occasioned thereby: we judge of
the health of children by their sleeping quietly, and of their
ilness by their watching, crying, and screaming. Watch-
ing may proceed from the milk being corrupted in the flo-
ach, or from cordivenes, or from wind.

In this disorder the body should be always kept open,
first by a clyster, and then a purge; and the absorbents
are to be given, and carminatives, particularly powder of
anifeed; and the belly is to be anointed with carminative
oil. Soon after the purge, give two drams of oil of al-
monds. The nurses should avoid acid and flatulent things,
and catching cold. Opiates, diascordium, and theriaca,
must never be used, unless in cafes of extreme necessity.

Of the Aphthae, or Thrush.

The aphthae are little whitish ulcers affecting the whole
superficies of the mouth, that is, the lips, gums, checks,
tongue, palate, and fauces; nay, they even descend through
the oesophagus to the stomach and intestines, and to the
anus; but then they are very dangerous, and commonly
put a period to the infant's life.

Boerhaave says, if the aphthae are of a pearl-colour,
pellucid, white, few in number, superficial, soft, and
fall off easily, apt to return in part, they are of the best
sort; but if they are white or opaque, like bacon, yellow,
brown, black, thick, denfe, running together, hard, te-
nacious, constantly restored, corrosive, they are bad.

Harris believes gargles to be of little service, because
infants cannot use them, inasmuch as they swallow every
thing that is put into their mouths. He therefore relies
for a cure on the tafaceous powders, and the moth gentle
cathartics, and believes them sufficient.

Allen says the decoction of elm-bark is the best gar-
garmin for the cure of the aphthae.
This disease often attacks adults in acute diseases and inflammation of the viscera. Boerhaave observes they are most common among the northern people, that inhabit low marshy places, and often attend a continual purrid fever, or an intermittent becoming continual; and that they are ushered in with a diarrhoea, or a dysentery, a nauseae, vomiting, loss of appetite, great anxiety about the precordia often returning, some great evacuation of the fluids, a fluxor and dulness, illeoptics, a perpetual complaint of weight about the stomach.

If it wheezy, hot, diluting, resolvent, and detergent medicines must be given, that the crust may be dispossed to fall off easily.

Huxham advises, when the aphthae supervene in fevers, to use gargles frequently of emollients and detergents, made with fuke, hydromel, decoction of turnips, &c. To give rhubarb inwardly, chiefly if the patient is gripped and loofe, adding an aromatic astringent with absorbents.

Of the Stoppage of the Nose.

There is often an excoriation of the parts near the pudenda, chiefly of the groin and scrotum; in the wrinkles of the neck, under the arms, and in other places, proceeding from the acrimony of the urine and sweat. From this proceed itching pains, crying, watching, and redness.

To remedy this, the parts affected may be washed often with warm water, and sprinkled with drying powders, such as chalk, burnt hartshorn; but especially tutty, and cerufs, which may be tied closely in a rag, and the powders shook out on the disordered places.

If the parts affected are more sore, and tend to a real ulceration, it will be proper to add a little faccharum sanitatum to the powders. Likewise a little white vitriol dissolved in spring water, and daubed upon the part, will dry and heal it very powerfully.

Of the Stoppage of the Nose.

The nostrils of infants are often plugged up with a greasemucus, infomuch that they can scarce breathe, or suck, or swallow; which renders them very unquiet and uneasy. To cure it, after a suitable purge, diffuse two or three grains of white vitriol in half an ounce of molarium water; then filter it, and apply it now and then to the nostrils with a linen rag.

Or you may apply oil of sweet almonds, impregnated with the oil of molarium, to the bottom and sides of the nostrils, which will resolve the filth, and render the respiration free.

Of the Scabby Eruptions and Crusta Lactea.

The heads of children are often troubled with aches or scabby eruptions; and if the face is affected with them, they are called crusta lactea. These are expelled by the benefit of nature; and, before the eruption, the infant is often troubled with epileptic fits from the irritation of the morbid matter.

If the humours strike in, either spontaneously or by improper applications, or if the exanthemata are of a blackish colour, they are very dangerous, and the infant generally falls into an asthma or a fatal epilepsy.

In the cure, externals, and especially such as are repelling, should be avoided; and things should be given inwardly which correct and temperate the blood, and expel the noxious matter by a diaphoresis. After the prime one is purged, both the nurse and child should take alexipharmics in the morning, and the tallow powders with calx of antimony, amber, and cinnabar, in the afternoon.

Externally, nothing of sulphur or mercury should be applied, or repelling lotions, or any thing cold. To mollify the febfs, fresh butter, or calves marrow, or cream, are sufficient. This case often proves obstinate; and then the nurse should observe a strict regimen, take sweeteners of the blood, and purgatives now and then.

Of a Diarrhoea and Vomiting.

The diarrhœa of infants is not to be stopped, either with astringents or narcotics; for astringents turn the flux of sharp humours towards the noble parts, and endanger the life of the child; and, though narcotics appease the ferocity of the turbulent humour for a time, yet they afterwards break out with greater force. Besides, opiates are too powerful for the tender constitution of infants, and must not be given at all, or with the utmost caution. In slight cases, diacordium may be ventured upon, to five or six grains; but, if there is a fever, it cannot be given without danger.

Therefore the best way is to give chalk, coral, pearls, and the like, of which about half a scruple is a dose; which will abate the orgasm of the humours, without kindling any new heat; after which the cure may be completed with rhubarb, from five grains to half a scruple, in solutive syrup of roses.

With regard to Vomiting, if there is great plenty of febrous and noxious humours in the stomach, infomuch that the stomac can retain nothing, if the child is a year or two old, he may safely take some grains of ipecacuanha; Harris says xv: but surely a third part of that quantity, nay, one or two grains, may be sufficient; for this does not require the swallowing of much liquor after it as some others; and yet clears the stomach of crudities, viscidities, and other bad humours.

Of Difficult Breeding the Teeth.

Among all the disorders which afflict children, there are none that generate such grievous symptoms as difficult dentition. About five or six months after birth, the teeth generally begin to make their appearance; first the incisors, or fore-teeth; next the canini, or dog-teeth; and lastly, the molares, or grinders. About the seventh year there comes a new set; and at twenty-one the two inner grinders, called dentes sapientise.

At the time of cutting their teeth, they flavor very much, and have a diarrhoea, which is no bad sign; but when it is difficult, especially when the canine teeth begin to be in motion, and to make their out-way out through the gums, the child has startings in his sleep, tumours of the gums, ulcers, inquietude, watchings; a loozeness of joints, greenish flops, the throat, fever, difficult breathing, suffocating catarrhs, convulsions, epilepsies, which often end in death.
It shews dентition is like to be bad, if the child is perpetually crying, thrusts his fingers into his mouth, and bites the nurse’s nipples; if unequal tubercles are perceived in the gums, both by the sight and touch, where the teeth are expected to appear; if there is heat in the mouth and the whole body; if they start without a cause, especially in sleep. These do not come on without great swelling, and sometimes a diarrhoea, as was mentioned above.

Morgan affirms in this case, it will be best to abate the cervecence of the blood with diluters; to appease the pain with gentle opiates; to open the body with purges and clysters; to draw off the fermented serum by blistering; to promote the cutting of the teeth by cooling, relaxing, and opening the gums; for this purpose diascinum is good; or a strong decoction of marsh-mallows and poppy heads, in thick milk, cream, or nears-foot oil: These take off the heat, and allage the pain.

**Of the Rickets.**

Children are seldom attacked with rickets before they are nine months, and after they are two years old; but it frequently happens in the intermediate space between these two periods. It may proceed originally from the disorders of the parents, and may be increased by those of the nurse.

It is likewise promoted by feeding the child with aqueous and mucous substances: crude summer-fruits, fish; by unleavened farinaceous aliment, and too great a quantity of sweet things; by an intermittent tumultuous ague, or other chronic or acute disorders; by a striking in of the itch or herpes; by the suppression or injudicious cure of ulcers; by being enervated with baths, fomentations, ointments, or moif vapours; by continual rest in a perforated chair, with his coats up.

The disorder is known, in those who cannot walk, from the caufes preceding; from his brothers or sisters having the same disease; from a fiabcul tumour of the head and face; from a flabby loose skin; from a swelling of the abdomen; from a falling awa y of the reft of the parts, espec ially of the muscles; from protuberances of the epiphyses of the joints, such as the wrists, ankles, knees, elbows, &c.; from the magnitude of the jugular veins and arteries, while the rest decrease. The legs grow crooked.

In those that have begun to walk, besides the former signs, there is a crawling, deility, and tottering in his motion; which soon proceeds to a constant desire of sitting, and afterwards changes to lying down: insomuch that nothing at laft is moveable, but the neck and head. Add to these, an early wit, an underftimulating which exceeds his age, while the appetite and digestion continue unhurt.

As he grows older, his head is enlarged, with ample futures; his thorax is comprimedit on the sides; and his sternum rises up sharp, while the extremities of the ribs are knotty. The abdomen is protuberant, and the teeth black and carious. These disorders sensibly increasing, are the cause ever after of pernicious diseases of the same kind; principally a spina ventosa, and a caries of the bone.

In the mean while a low feverish disorder preys upon the whole body, till the time of death; and then all the fibres, vessels, and viscera appear to be soft, flabby, and the fluids dissolved and mucous.

The cure is to be attempted with light, nourishing, dry aliment, not fat, but seasoned, and taken often: With a little found drink, such as beer, not stale, but well boiled and fine: With a dry warm air, and dry warm woolen clothing: With being carried about in the arms, and often shook, swung, and put in motion: With being driven in a vehicle over the stones: With repeated friffions with warm dry flannel, sprinkled with aromatics; especially the abdomen and spine of the back: With prudently repeated blistering, with strengthening purges, for several days successively: As also by the continued use of strengthening, drying, antiscorbous remedies, and such as raise the spirits.

Particularly for food, the bread should be biscuit, with a little saffron and spices. The flesh should be pigeons, pullets, veal, rabbets, mutton, gently roasted, minced, and mixed with biscuit, falt, a little parsley, thyme, nutmeg, or the like.

Likewise rice, miller, pearl barley, boiled with raisins; to which add a little wine and spice. The drink may be generous French red wine, of which give an ounce three or four times a-day.

**Pocket-Medicines.** In surgery, those which a surgeon ought to carry always about him, in a box or convenient case.

Thofe, according to Heifler, are the common digestive ointment, and the bronc or Egyptian ointment, for cleansing and digelling foul ulcers, and some vulnerary balsams, as the linimentum arcei, or the balm of Peru, of Gilead or Capivi, or the Samaritan balm: to these must also be added a platter or two, as the

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MEDINA, a city of Arabia Deferta, situated two hundred miles north-west of Mecca; in E. long. 40° 3'.

This is called the city of the prophet, on account of Mahomet's being received and protected by the inhabitant's on his flight hither from Mecca, where the Mahometan era commences.

MEDITERRANEAN sea, extends from the straits of Gibraltar to the coasts of Syria and Palestine, being upwards of 2000 miles in length, but of a very unequal breadth; the west-part of it separates Europe from Africa; and the Levant or east-part of it divides Asia from Africa.

MEDITULLUM, is used by anatomists for that spongy substance between the two plates of the cranium, and in the interstices of all laminated bones.

MEDIUM, in logic, the mean or middle term of an syllogism, being an argument, reason, or consideration for which we affirm or deny any thing: or, it is the cause why the greater extreme is affirmed or denied of the less in the conclusion.

MEDIUM, in arithmetic, or arithmetical medium, or mean, that which is equally distant from each extreme, or which exceeds the lefser extreme as much as it is exceeded by the greater, in respect of quantity not of proportion: thus 9 is a medium between 6 and 12.

MEDIUM, in philosophy, that space or region through which a body in motion passes to any point; as thus air, is the medium wherein bodies move near our earth; water, the medium wherein fishes live and move; and glass is also a medium of light, as it affords it a free passage. That density or consistence in the parts of the medium, whereby the motion of bodies in it is retarded, is called the refitance of the medium; which together with the force of gravity, is the cause of the evacuation of the motion of projectiles.

Subtile or aetherial Medium. See ETHER.

MEDLAR, in botany. See MELEUS.

MEDULLA, in anatomy. See ANATOMY, p. 147.

MEDULLA OBLONGATA. See ANATOMY, p. 287.

MEDULLA SPINALIS. See ANATOMY, p. 288.

MEDUSA, in zoology, a genus of insects belonging to the order of molucca. The body is gelatinous, roundish, and depressed; and the mouth is in the centre of the under part of the body. There are twelve species, all natives of the sea.

MEDWAY, a river which rises in Ashdon forest in Suffolk; and running through Kent, is divided into two branches by the Isle of Sheppy, one of which is called East Swale, and the other West Swale.

MEISSEN, once the capital of the marquisate of Mißen or Missia, in Upper Saxony, on the river Elbe, ten miles north of Dresden.

MELOPODIUM, in botany, a genus of the dicotyledonous monoecious clafs. The calyx has four segments; the petals are five; and the stamens are usually placed in a single whorl, and the pistil has one or two ovules.

MELOANCHOLY, in medicine, a kind of delirium, attended with gloomy thoughts, heaviness, and sorrow. See MEDICINE.

MELANE, in natural history, a very beautiful fossil of a dense, compact, and regular texture, and of an extremely bright pale yellow, resembling nothing so much as the purest gold; it is remarkably heavy, and is usually found in little irregular masses of the bigness of a pigeon's egg, which are broken with a slight blow: but it is usually met with in the form of a fine gold-coloured efflorescence or vitriolic and pyritical bodies; or in loose, shatterly, and friable masses of a more dusky yellow; in which latter state it so much resembles a native sulphur, that it is frequently mistaken for one; however, it is not inflammable; but calcines in the fire to a greyish powder, which, by burning longer changes to a deep and fine purple.

The Greeks used it externally, as a gentle emollient and a styptic: they made it an ingredient in their ointments for old ulcers, and used to sprinkle the powder of it on fresh wounds to stop the hemorrhage.

MELANTHERIA, in botany, a genus of the monogynia class. The corolla consists of six petals; and the filaments are composed of the long unguis of the corolla: there are three species, none of them natives of Britain.

MELANURUS, in ichthyology. See SPARUS.

MELASTOMA, in botany, a genus of the decandria monogyne class. The calyx is bell-shaped, and has four segments; the petals are five, inserted into the calyx; and the berry has five cells. There are twelve species, none of them natives of Britain.

MELCHITES, in church-history, the name given to the Syriac, Egyptian, and other Christians of the Levant. The Melchites, excepting some few points of little or no importance, which relate only to ceremonies and ecclesiastical discipline, are in every respect protected.
MELCHISEDCHIANS, in church history, a sect which arose about the beginning of the third century, and affirmed, that Melchisedek was not a man, but a heavenly power, superior to Jesus Christ: for Melchisedek, they said, was the intercessor and mediator of the angels; but Jesus Christ was so only for men, and his priesthood only a copy of that of Melchisedek.

MELEAGRIS, the turkey, in ornithology. The pavo, or North American turkey of Ray, has a caruncle both on the head and throat; and the breast of the male is bearded. He lives upon grain and insects. When the cock struts, he blows up his breast, spreads and erects his feathers, relaxes the caruncle on the forhead, and the naked parts of the face and neck become intensely red. The calyx is smaller. There are three species, viz. 1. The gallo-pavo, or North American turkey of Ray, has a caruncle both on the head and throat; and the breast of the male is bearded. He lives upon grain and insects. When the cock struts, he blows up his breast, spreads and erects his feathers, relaxes the caruncle on the forhead, and the naked parts of the face and neck become intensely red. 2. The crista, or Brainalian pheasant of Ray, has an erect crest of feathers on the head, and violet-coloured temples: it has a caruncle on the throat, but none on the head. 3. The fatra, or Swallow-tailed pheasant of Edwards, has two blue horns behind the eyes, a red body spotted with black and white.

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MELON, in botany. See Cucumis.

MELODY, in music, the agreeable effect of different sounds, ranged and disposed in succession; so that melody is the effect of a single voice or instrument, by which it is distinguished from harmony.

MELOE, in zoology, a genus of insects of the order of Coleoptera. The antennae are jointed, the larva jointed, the bract is roundish; the elytra are arched and flexible; and the head is inflected and gibbous. There are 16 species, principally distinguished by their color. The vesicatorius, or cantharis of the hops, when bruised, is universally used as a blistering plaster.

MELON, in botany. See Cucumis.

MEMBRA, in architecture, denotes any part of a building; as, a frieze, cornice, or the like. This word is also sometimes used for the moulding. See Moulding.

MEMBER of parliament. See Parliament.

MEMBERED, in heraldry, is where the legs or feet of an eagle, griffin, or other bird, are of a different colour from the rest of the body.

MEMBRANE, in anatomy, a pliable texture of fibres interspersed together in the same plane. See Anatomy, part I and II.

MEMECYLON, in botany, a genus of the Odontacae clausa. The calyx is above the fruit, and the corolla is monopetalous and bell-shaped; and the berry has one cell, containing many seeds. In Canada, Virginia, and Jamaica, where this fruit commonly grows, it is pickled for the table.

MELTING cone, in assaying. See Chemistry, p. 113.

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MEMECEYLON, in botany, a genus of the Odontacae clausa. The calyx is above the fruit, and has an entire margin; the corolla consists of one petal; and the berry is crowned with a cylindrical calyx. There is but one species, native of Ceylon.

MEMOIRS, in matters of literature, a species of history, written by persons who had some share in the transactions they relate; answering to what the Romans called Commentarii.

MEMORY, a faculty of the human mind, whereby it retains and recalls the ideas it has once perceived. See Metaphysics.

MEMPHIS, once the capital of Egypt, stood on the west side of the Nile, almost opposite to Grand Cairo.

MENDICANTS, or begging friars, several orders of religious in Popish countries, who, having no settled revenues, are supported by the charitable contributions they receive from others.

MENGRELIA, a province of Asiatic Turkey, situated on the north-east part of the Euxine sea, between Georgia and Circassia, where the Turks purchase boys and young women for their seragios.

MENIALS, domestic or household servants, who live under their lord or master's roof.

MENINGES, or Meninges, in anatomy, a name given to the dura and pia mater of the brain.

MENISCUS, in optics, a lens convex on one side, and concave on the other. See Optics.

MENISPEMUM, in botany, a genus of the Dicata dioecia clausa. The calyx consists of five segments, and the corolla of five petals. It has three berries, containing each a kidney-shaped seed. There are seven species, none of them natives of Britain.

MENNISTITES, a sect of baptists in Holland, called from Mennon Simonis of Friesland, who lived in the sixteenth century. This sect believe, that the New Testament is the only rule of faith; that the terms Person and Trinity are not to be used in speaking of the Father, Son, and Holy Ghost; that the first man was not created perfect; that it is unlawful to swear, or to wage war upon any occasion; that infants are not the proper subjects of baptism; and that ministers of the gospel ought to receive no salary.

MENOLOGY, the Greek calendar, in which the lives of the saints in short, or barely their names, are cited; answering nearly to the martyrology of the Latin church. See Martyrology.

MENSA, in law-books; a term that includes in it all patrimony, and necessaries for livelihood.

MENSALS, in church-history, such livings as were formerly united to the tables of religious houses, and hence called mensal benefices.

MENSES, Flours, Courses, Catamenia, in medicine, the monthly evacuations from the uterus of women not with child and not giving suck. See Medicine.

MENNONITES, a sect of baptists in Holland, called from Mennon Simonis of Friesland, who lived in the sixteenth century. This sect believe, that the New Testament is the only rule of faith; that the terms Person and Trinity are not to be used in speaking of the Father, Son, and Holy Ghost; that the first man was not created perfect; that it is unlawful to swear, or to wage war upon any occasion; that infants are not the proper subjects of baptism; and that ministers of the gospel ought to receive no salary.

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Fig. 1. Mantle

Fig. 2. Martlets

Fig. 3. Meleagris or Horned Pheasant

Fig. 4. Mergus or Round Crested Duck

Plate CX.
MERCHANT, a person who buys and sells commodities in grofs, or deals in exchanges; or that traffics in the way of commerce, either by importation or exportation. See Commerce.

MERCURY, in botany, a genus of the dioecia ericacearum class. The calyx of both male and female consists of three segments; neither of them have any corolla; the stamens are from nine to twelve; the anthers are globular and didymous; the female has two stigmas; and the capsule has two cells, and one seed in each. There are four species, two of them natives of Britain, viz. the perennis, or dogs mercury; and the annua, or French mercury.

MERCURY, in natural history. See Chemistry, p. 85, and 137.

MERCURY, ⊗, in astronomy. See Astronomy, p. 436.

MERCURY, in heraldry, a term used in blazoning by planets, for the purple colour in the arms of sovereign princes.

MERCURY, in ornithology. See Propitia cupiditas.

MERCURY, ⊗, in astronomy. See Propitia cupiditas.

MERCURY, in botany, a genus of the dicotyledonous class. The calyx of both male and female consists of three segments; neither of them have any corolla; the stamens are from nine to twelve; the anthers are globular and didymous; the female has two stigmas; and the capsule has two cells, and one seed in each. There are four species, two of them natives of Britain, viz. the perennis, or dogs mercury; and the annua, or French mercury.

MESIPPI, or Meschipsi, a country of North America, bounded by Canada on the north, the British plantations on the east, the gulf of Mexico on the south, and the province of New Mexico on the west.

MESSENGERS, are certain officers chiefly employed under the direction of the secretaries of state, and always in readiness to be sent with all kinds of dispatches foreign and domestic. They also, by virtue of the secretaries warrants, take up persons for high treason, or other offences against the state.

MESSIAS, in botany, a genus of the icofandria class. The calyx consists of five segments, and the corolla of numerous linear petals; and the capsule is fleshly below the flower, and contains many seeds. There are 45 species, none of them natives of Britain.

MESTERY, in anatomy. See Anatomy, p. 262.

MIDIAN, in astronomy. See Geography, and Astronomy.

MERCURY, in botany, a genus of the dioecia ericacearum class. The calyx of both male and female consists of three segments; neither of them have any corolla; the stamens are from nine to twelve; the anthers are globular and didymous; the female has two stigmas; and the capsule has two cells, and one seed in each. There are four species, two of them natives of Britain, viz. the perennis, or dogs mercury; and the annua, or French mercury.

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METAPHYSICS is that part of philosophy which considers the nature and properties of thinking beings.

Aristotle, after treating on physics, begins his next book, (in which he pretends to elevate the mind above corporeal objects, to fix it in the contemplation of God, of angels, and of things spiritual, and to enable it to judge of the principles of sciences by abstraction,) with the Greek words μετα τω φυσικων, φυλο ψυχικων, 1. e. after metaphysics. His disciples, and succeeding philosophers, have formed, of these two, one word, METAPHYSICS, by which they mean that science of which we have just now given the definition.

Metaphysics is divided, according to the objects that it considers, into six principal parts, which are called, 1. Ontology: 2. Cosmology: 3. Anthropology: 4. Psychology: 5. PneumatoLOGY: and, 6. Theodicy, or metaphorical theology.

1. The doctrine that is named Ontology, is that part of metaphysics which investigates, and explains, the nature and general essence of all beings, as well as the qualities and attributes that essentially appertain to them, and which we ought to assign them by abstraction, as considering them a priori. Hence it appears, that this doctrine should proceed in its operations from the most simple ideas; such as do not admit of any other qualities of which they may be compounded. These simple ideas are, for example, those of being, of essence, of substance, of mode, of existence as well with regard to time as place, of a necessary cause, of unity, the idea of negation, the difference between a being that is simple or compound, necessary or accidental, finite or infinite; the idea of efficient and abstractive properties, as of the greatness, perfection, and goodness of beings; and so of the rest. The business therefore of ontology, is to make us acquainted with every kind of being in its essence and abstractive qualities, and such as are distinct from all other beings. This knowledge being once established on simple principles, just conclusions may from thence be drawn, and those things proved after which metaphysics inquires, and which is its business to prove.

It is easy to conceive, that even a clear knowledge of beings, and their essential properties, would be still defective and useless to man, if he did not know how to determine and fix his ideas by proper denominations, and consequently to communicate his perceptions to those whom he would instruct, or against whom he is obliged to dispute, as they would not have the same perceptions that he has. It is, by the way, perhaps one of the greatest advantages that we have over other animals, to be able so to determine our ideas by signs or denominations, either of writing or speech, as to refer each particular perception to its general idea, and each general perception to its particular idea. To render therefore our ideas intelligible to others, we must have determinate words or denominations for each kind; and ontology teaches us those terms which are so necessary to fix our ideas, and to give them the requisite
requisite perplicity and precision, that we may not dis- 5. The fifth part of metaphysics is called Pneumatol- pute about words when we endeavour to extend the sphere ogy. It is not a very long time since this term has been of our knowledge, or when we debate concerning the invented, and that metaphysicians have made of it a definite doctrine. By this they mean the knowledge of all essence of an object, or endeavour to make it more evident. spirits, angels, &c. It is easy to conceive that infinite art is It is for this reason that ontology was formerly regarded necessary to give an account of what we do not absolutely as a barren science, that consulted of technical terms only; as a materia lmentology: whereas the best modern philosophicks make it a more substantial science, by annexing as a mere terminology: whereas the best modern determinate ideas to those words, and the examination of philosophers make it a more substantial science, by of those objects themselves that these terms imply. But the annexing determinate ideas to those words, and the examination of misfortune is, to speak the truth, that in this ontologic determination there is still much uncertainty and sophi- those words, and the examination of those objects themselves that these terms imply. But the fulty. For, in the first place, we yet know of no metaphysics where all the definitions are jule; and in the misfortune is, to speak the truth, that in this ontologic second place, the words that are employed in these definitions determination there is still much uncertainty and sophi- have always something equivocal in their meaning, and try. For, in the first place, we yet know of no metaphysics have consequently themselves need of definitions; and in and the examination of those objects themselves that these terms imply. But the in this manner we may recede to infinity, unless we recur misfortune is, to speak the truth, that in this ontologic to the first impressions that the simple words have made in determination there is still much uncertainty and sophi- our minds, and the primitive ideas which they there fty. The words man, love, coach, &c. say more, and make a stronger impression than all the definitions we can give of them; by ontologic explications they are always covered with a dark cloud.

2 Metaphysics, after having, in as solid a manner as possible, explained and established the principles above mentioned, continues its inquiries to the second part, that is called Cosmology, and examines into the essence of the world, and all that it contains; its eternal laws; of the nature of matter; of motion; of the nature of tangible bodies, of their attributes and essential qualities, and of all that can be known by abstraction, and sometimes also by adding the lights that man acquires concerning them by the experience of his senses. It is also in cosmology that we examine the Leibnitizian system; that is, whether God, in creating the world, must necessarily have created the best world; and if this world be in effect. And in this manner they purse the argument from consequence to consequence to its last resort. All philosophers, however, do not go equally deep. Each mind has its dofe of penetration. Due care should be likewise taken, that sibility, in this chain of reasoning, carried beyond the general bounds of the human mind, do not prejudice either the perplicity or the truth of ideas: seeing that error here too nearly approaches the truth; and that every idea, which cannot be rendered intelligible, is in effect equal to a falfe idea.

3 Anthrophology, or the knowledge of man, forms the third branch of metaphysics. It is subdivided into two parts. The first, which consists in the knowledge of the exterior parts of the human frame, does not belong to this science: anatomy and physiology teach that. The business here is only a metaphysical examination of man, his existence, his essence, his essential qualities and necessary attributes, all considered a priori; and this exam- en leads at the same time to

4 Psychology, which is the fourth part of metaphysics, and consists in the knowledge of the soul in general, and of the soul of man in particular; concerning which, the most profound, the most subtle and abstract researches have been made, that the human reason is capable of producing; and concerning the substance of which, in spite of all these efforts, it is yet extremely difficult to assert any thing that is rational, and still less any thing that is positive and well supported.

6 Metaphysical Theology, which M. Leibnitz and some others call Theodicy, is the sixth and last doctrine of metaphysics. It teaches us the knowledge of the existence of God; to make the most rational suppositions concerning his divine essence, and to form a just idea of his qualities and perfections, and to demonstrate them by abstract reasoning a priori. Theodicy differs from natural theology, in as much as this last borrows, in fact, from theodicy, proofs and demonstrations to confirm the existence of a Supreme Being; but after having boldly established that great truth, by extending its consequences, natural theology teaches us what are the relations and connections that subsist between that Supreme Being and man, and what are the moral duties that result from that connexion. As pneumatology is a science highly infidious and chimerical, so is metaphysical theology susceptible of found argument and demonstration; to the great comfort of mankind, the whole of whose happiness is founded on the certainty of this science. If the effects and operations of spirits in the universe were as evident as the effects and operations of the Deity, and their necessary existence as capable of being proved a priori, pneumatology would be a doctrine of equal certainty with theodicy: but as neither one nor the other can be proved, with regard to spirits in general, whilst God manifests himself in every part of nature, we have only to de- fend from the most simple and abstract ideas, to those that are the most compound; and from thence to reaffect, by a chain of reaffectings, from the creature up to the Author of the creature and of all nature: We shall find, that the refult of all these operations of the mind will constantly be, The necessity of the existence of a God; and we may at all times determine, though very imperfectly, from the weaknesses of our discernment, what that Supreme Being must be, by positively determining what he cannot be. Everything that can concur to furnish new proofs on this subject, or to elucidate and establish those which are already known, is therefore of insensible value to mankind: and though this was the only object of metaphysics, it would highly merit the attention of those of the most refined and most exalted genius.

After giving this general view of the subject, we shall proceed.
proceed to give the substance of what Mr Locke has delivered upon it.

Of ideas in general, and their original.

By the term idea, as defined by Mr Locke, is meant whatever is the object of the understanding when a man thinks, or whatever it is which the mind can be employed about in thinking.

In order to trace the manner by which we acquire these ideas, let us suppose the mind to be, as we say, unripe paper, void of all characters, without any ideas: how comes it to be furnished? whence has it all the materials of reason and knowledge? From experience and observation. This, when employed about external sensible objects, we may call sensation: by this we have the ideas of bitter, sweet, yellow, hard, &c. which are commonly called sensible qualities, because conveyed into the mind by the senses. The same experience, when employed about the internal operations of the mind, perceived and reflected on by us, we may call reflection: hence we have the ideas of perception, thinking, doubting, willing, reasoning, &c.

These two, viz. external material things as the objects of sensation, and the operations of our own minds as the objects of reflection, are the only originals from whence all our ideas take their beginnings: the understanding seems not to have the least glimmering of ideas, which it doth not receive from one of these two sources. These, when we have taken a full survey of them, and their several modes and compositions, we shall find to contain our whole stock of ideas: and that we have nothing in our minds which did not come in one of these two ways.

It is evident, that children come by degrees to be furnished with ideas from the objects they are conversant with: they are so surrounded with bodies that perpetually and diversely affect them, that some ideas will (whether they will or no) be imprinted on their minds. Lights and colours, sounds and tangible qualities, do continually solicit their proper senses, and force an entrance into the mind. It is late, commonly, before children come to have ideas of the operations of their minds; and some men have not any very clear or perfect ideas of the greatest part of them all their lives: because, though they pass there continually, yet, like floating visions, they make not deep impressions enough to leave in the mind clear and lasting ideas, till the understanding turns inward upon itself, and reflects on its own operation, and makes them the objects of its own contemplation.

When a man first perceives, then he may be said to have ideas: having ideas, and perception, signifying the same thing.

Of simple ideas.

Of ideas, some are simple, others complex. A simple idea is one uniform appearance or conception in the mind, which is not distinguishable into different ideas. Such are the ideas of sensible qualities, which though they are in the things themselves so united and blended, that there is no separation, no distance between them, yet the ideas they produce in the mind enter by the senses simple and unmixed. Thus, though the hand feels softness and warmth in the same piece of wax, yet the simple ideas thus united in the same subject are as perfectly distinguishable as those that come in by different senses.

These simple ideas are suggested no other way than from the two ways above mentioned, viz. sensation and reflection.

The mind being once flooded with the simple ideas, has the power to repeat, compare, and unite them to an infinite variety; and so can make, at pleasure, new complex ideas. But the most enlarged understanding cannot frame one new simple idea; nor by any force destroy them that are there.

Of ideas of one sense.

Ideas, with reference to the different ways wherein they approach the mind, are of four sorts.

First, There are some which come into our minds by one sense only.

Secondly, There are others conveyed into the mind by more senses than one.

Thirdly, Others that are had from reflection only.

Fourthly, There are some suggested to the mind by all the ways of sensation and reflection.

First, some enter into the mind only by one sense peculiarly adapted to receive them. Thus colours, sounds, smells, &c. come in only by the eyes, ears, and nose. And if these organs are any of them so disordered as not to perform their functions, they have no other way to bring themselves in view, and be perceived by the understanding.

We shall here mention one, which we receive by our touch, because it is one of the chief ingredients in many of our complex ideas; and that is, the idea of solidity: it arises from the resistance one body makes to the entrance of another body into the place it possesseth, till it has left it. There is no idea which we more constantly receive from sensation than this. In whatever posture we are, we feel somewhat that supports us, and hinders us from sinking downwards: and the bodies we daily handle, make us perceive, that while they remain between them, they do, by an unassailable force, hinder the approach of the parts of our hands that press them. This seems to be the most essential property of body, and that whereby we conceive it to fill space: the idea of which is, that where we imagine any space taken up by a solid substance, we conceive it so to possess it, that it excludes all other solid substances. This resistance is so great, that no force can surmount it. All the bodies in the world pressing a drop of water on all sides, will never be able to overcome the resistance it makes to their approaching one another, till it be removed out of their way.

The idea of solidity is distinguished from that of pure space, in as much as this latter is neither capable of resistance nor motion: it is distinguished from hardness, in as much as hardness is a firm cohesion of the solid parts of matter making up masses of a sensible bulk, so that the whole doth not easily change its figure. Indeed, hard and soft, as commonly apprehended by us, are but relative to the constitutions of our bodies: that being called hard which will put us to pain sooner than change its figure by the pressure of any part of our bodies; and that soft, which
which changes the situation of its parts upon an easy and unpainful touch.

This difficulty of changing situation among the parts, gives no more solidity to the hardest body, than to the softest; nor is an adamant one jot more solid than water, he that shall fill a yielding soft body well with air or water, will quickly find its resistance. By this we may distinguish the idea of the extension of body, from the idea of the extension of space: That of body, is the cohesion or continuity of solid, separable, and moveable parts; that of space, the continuity of unsolid, inseparable, and immoveable parts. Upon the solidity of bodies depends their mutual impulse, resistance, and protrusion.

Of simple ideas of different senses.

Some ideas we get into the mind by more than one sense; as space, extension, figure, refl., and motion. These are perceivable by the eyes and touch.

Of simple ideas of reflection.

Some ideas are had from reflection only: Such are the ideas we have of the operations of our minds; of which the two principal are, perception, or thinking; and volition, or willing. The powers of producing these operations are called faculties; which are, the understanding, and will. The several modes of thinking, &c. belong to this head.

Of simple ideas of sensation and reflection.

There are some simple ideas conveyed into the mind by all the ways of sensation and reflection; such are pleasure, pain, power, existence, unity, succession. Pleasure or delight, pain or uneasiness, accompany almost every impression on our senses, and every action or thought of the mind.

The Author of our beings having given a power to our minds, in several inftances, to chuse amongst its ideas which it will think on; to excite us to these actions of thinking and motion, he has joined to several thoughts and sensations a perception of delight; without this we should have no reason to prefer one thought or action to another.

Pain has the same efficacy to set us on work that pleasure has; since we are as ready to avoid that, as to pursue this. This is worth our consideration, that pain is often produced by the same objects and ideas that produce pleasure in us. This their near conjunction gives us new occasion of admiring the wisdom and goodness of our Maker; who, designing the preservation of our being, has annexed pain to the application of many things to our bodies, to warn us of the harm they will do us, and as advices to withdraw us from them. But he not designing our preservation barely, but the preservation of every part and organ in its perfection, hath in many cases annexed pain to those very ideas which delight us. Thus heat, that is very agreeable to us in one degree, by a little greater increafe of it proves no ordinary torment: Which is wisely ordered by nature, that when any object does by the vehemence of its operation disorder the instruments of sensation, whose structures cannot but be very delicate, we might by the pain be warn-

ed to withdraw before the organ be quite put out of order. That this is the end of pain, appears from this consideration; that though great light is insufferable to the eyes, yet the highest degree of darkness does not at all distress them; because that causes no disorderly motion in that curious organ the eye. But excess of cold, as well as heat, pains us; because it is equally destructive to the temper which is necessary to the preservation of life.

Existence and unity are two other ideas suggested by every object without, and every idea within. When ideas are in our minds, we consider them as being actually there, as well as we consider things to be actually without us; which is, that they exist, or have existence; And whatever we consider as one thing, whether a real being, or idea, suggests the idea of unity.

Power is another idea derived from these sources: For finding in ourselves that we can think, and move several parts of our bodies at pleasure, and observing the effects that natural bodies produce in one another; by both these ways we get the idea of power.

Succession is another idea suggested by our senses, and by reflection on what passes in our minds: For if we look into ourselves, we shall find our ideas always, whilst we are awake, or have any thought, passing in train, one going and another coming, without intermission.

Some further considerations concerning simple ideas.

Whatever is able, by affecting our senses, to cause any perception in the mind, both thereby produce in the understanding a simple idea; which, whatever be the cause of it, is looked upon as a real positive idea in the understanding. Thus the ideas of heat and cold, light and darkness, motion and rest, &c. are equally positive in the mind, though some of their causes may be more private.

That a privative cause may produce a positive idea, appears from shadows; which (though nothing but the absence of light) are discernible, and cause clear and positive ideas. We have indeed some negative names which stand not directly for positive ideas, but for their absence; such as insipid, silence, which denote positive ideas, viz. taste and sound, with a signification of their absence.

It will be useful to distinguish ideas as they are perceptions in our minds, from what they are in the bodies that cause such perceptions in us; for we are not to think the former exact images and resemblances of something inherent in the subject, most of those of sensation being, in the mind, no more the likenesses of something existing without us, than the names that stand for them are the likenesses of our ideas, which yet, upon hearing, they excite in us.

Whatever the mind perceives in itself, or is the immediate object of perception, thought, or understanding, is an idea; And the power to produce any idea in our mind, is the quality of the subject wherein that power exists. Thus a snow ball having the power to produce in us the ideas of white, cold, and round; those powers, as they are in the snow-ball, are called qualities; and as they are sensations or perceptions in our understandings, they are called ideas. These qualities are of two sorts; First, original, or primary; such are solidity, ex-

Y y tension,
Perception is the first idea we receive from reflection: It is by some called thinking in general: Though thinking, in the propriety of the English tongue, signifies that sort of operation of the mind about its ideas, where in the mind is active; where it considers any thing with some degree of voluntary attention: For in bare perception the mind is, for the most part, only passive; and what it perceives, it cannot avoid perceiving. What this is, we cannot otherwise know, than by reflecting on what palls in our minds when we see, feel, hear, &c.

Impressions made on the outward parts, if they are not taken notice of within, cause no perception; as we fee in those whose minds are intently buried in the contemplation of certain objects.

We may observe that the ideas we receive from sensation, are often in grown people altered by the judgment, without our taking notice of it. Thus a globe of any uniform colour, (as of gold, or jet,) being set before our eyes, the idea thereby imprinted is of a flat circle variously shadowed: But being accustomed to perceive what kind of appearance convex bodies are wont to make in us, the judgment alters the appearances into their caues; and, from that variety of shadow or colour, frames to itself the perception of a convex figure of one uniform colour. This in many cases, by a settled habit, is performed so readily, that we take that for the perception of our sensation, which is but an idea formed by the judgment; so that one serves only to excite the other, and is scarce taken notice of itself: As a man who reads or hears with attention, takes little notice of the characters or sounds, but of the ideas that are excited in him by them.

Perception is also the first step and degree towards knowledge, is called retention; which is the keeping of those ideas it has received. Which is done two ways:

First. By keeping the idea which is brought into the mind for some time actually in view; which is called contemplation.

Secondly, By reviving those ideas in our minds which have disappeared, and have been, as it were, laid out of sight: And this is memory; which is, as it were, the storehouse of our ideas; for the narrow mind of men being nothing but a repository to lay up those ideas, which at another time it may have use of. But our ideas being nothing but actual perceptions in the mind, which cease to be any thing when there is no perception of them, this lying up of our ideas in the repository of the memory signifies no more but this, that the mind has a power, in many cases, to revive perceptions it has once had, with this additional perception annexed to them, that it has had them before. And it is by the assistance of this faculty, that we are said to have all those ideas in our understandings which we can bring in view, and make the objects of our thoughts, without the help of those sensible qualities which first impressed them there.

Those ideas that are often refreshed by a frequent return of the objects or actions that produce them, fix themselves fast in the memory, and remain longest there: Such are the original qualities of bodies, viz. Solidity, Extension, Figure, Motion, &c. These and the like are seldom or ever loit while the mind retains any ideas at all.
Of discerning, and other operations of the mind.

Another faculty of the mind, is that of discerning between its ideas. On this depends the evidence and certainty of several general propositions. In being able nicely to distinguish one thing from another, where there is the least difference, consists, in a great measure, that exactness of judgment and clearness of reason which is to be observed in one man above another.

To the well distinguishing our ideas, it chiefly contributes that they be clear and determinate; and when they are so, it will not breed any confusion or mistake about them, though the senses should convey them from the same object differently on several occasions.

The composing of our ideas one with another in respect of extent, degree, time, place, or any other circumstances, is another operation of the mind about its ideas which is the ground of relations. Brutes seem not to have this faculty in any great degree. They have probably several ideas distinct enough; but cannot compare them farther than some sensible circumstances annexed to the objects themselves.

Composition is another operation of the mind, whereby it combines several of its simple ideas into complex ones: Under which operation we may reckon that of enlarging; wherein we put several ideas together of the same kind, as several units to make a dozen.

Abstraction is another operation of the mind, whereby the mind forms general ideas from such as it received from particular objects; which it does by considering them, as they are in the mind such appearances separate from the circumstances of real existence, as time, place, &c. These become general representatives of all of the same kind, and their names applicable to whatever exists comparable to such abstract ideas. Thus the colour received from chalk, snow, and milk, is made a representative of all of that kind; and has a name given it (whiteness,) which signifies the same quality, wherever to be found or imagined. And thus universals, both ideas and terms, are made.

Of complex ideas.

In the reception of simple ideas the mind is only passive, having no power to frame any one to itself, nor having any idea which does not wholly consist of them. But about these simple ideas it exercises several acts of its own, whereby out of them, as the materials and foundations of the rest, the other are framed: The acts of the mind, wherein it exercises its power over its simple ideas, are chiefly these three: First, It combines several simple ideas into one compound one; and thus all complex ideas are made. Secondly, It brings together, whether simple or complex, ideas, and fuses them by one another, so as to take a view of them at once, without uniting them into one; by which way it gets all its ideas of relations. Thirdly, It separates them from all other ideas that accompany them in their real existence: And thus all its general ideas are made. As simple ideas are observed to exist in several combinations united together, so the mind may consider them as united, not only as they are really united in external objects, but as itself has joined them ideas thus made up of several ones put together, are called complex; as man, army, beauty, gratitude, &c. By this faculty of repeating and uniting together its ideas, the mind has great power in varying and multiplying the objects of its thoughts. But it is still confined to those simple ideas which it received from the two sources of sensation and reflection. It can have no other ideas of sensible qualities, than what come from without by the senses, nor any other ideas of the operations of a thinking subsistence than what it finds in itself; but having once got these simple ideas, it can by its own power put them together, and make new complex ones, which it never received so united.

Complex ideas, however compounded and decomposed, though their number be infinite, and their variety endless, may all be reduced under these three heads: 1st, Modes; 2dly, Substances; 3dly, Relations.

1st, Modes are such complex ideas as contain not the supposition of subsisting by themselves, but are considered as dependences on, and affections of substances; as triangle, gratitude, murder, &c. These modes are of two sorts: First, Simple, which are combinations of the same simple idea; as a dozen, score, &c. which are but the ideas of so many distinct units put together. Secondly, Mixed, which are compounded of simple ideas of several kinds; as beauty, which consists in a certain composition of colour and figure, causing delight in the beholder; theft, which is the concealed change of the possession of any thing, without the consent of the proprietors. These visibly contain a combination of ideas of several kinds.

2dly, Substances. The ideas of substances are all such combinations of simple ideas, as are taken to represent distinct particular things subsisting by themselves, in which the confused idea of substance is always the chief. Thus a combination of the ideas of a certain figure, with the powers of motion, thought, and reasoning, joined to subsistence, make the ordinary idea of man.

These again are either of single substances, as man, stone; or of collective, or several put together, as army, heap. Ideas of several substances thus put together, are as much each of them one simple idea, as that of a man or an unit.

3dly, Relations; which consist in the consideration and comparing of one idea with another. Of these several kinds we shall treat in their order.

Of simple modes: And, first, of the simple modes of space.

Concerning simple modes we may observe, that the modifications of any simple ideas are as perfectly different and distinct ideas in the mind, as those of the greatest distance or contrariety: Thus two is as distinct from three, as blueens from best.

Space is a simple idea which we get both by our fight and touch. When we consider it barely in length between two bodies it is called distance: when in length, breadth, and thickness, it may be called capacity. When considered between the extremities of matter, which fills the capacity of space with something solid, tangible, and moveable, it is called extension. And thus extension will be an idea belonging to body; but space may be conceived without it.

Each
Each different distance is a different modification of space; and each idea of any different space is a simple mode of this idea. Such are an inch, foot, yard, &c. When these ideas are made familiar to men's thoughts, they can in their minds repeat them as often as they will, without joining to them the idea of body, and frame to themselves the ideas of feet, yards, or fathoms, beyond the utmost bounds of all bodies; and, by adding these till one to another, enlarge their idea of space as much as they please. From this power of repeating any idea of distance, without ever being able to come to an end, we come by the idea of immensity.

Another modification of space is taken from the relation of the parts of the termination of extension or circumference space amongst themselves; and this is what we call figure. This the touch discovers in sensible bodies, whose extremities come within our reach; and the eye takes both from bodies and colours, whose boundaries are within its view; where observing how the extremities terminate either in straight lines, which meet at discernible angles, or in crooked lines, wherein no angles can be perceived; by considering these as they relate to one another in all parts of the extremities of any body or space, it has that idea we call figure: which affords to the mind infinite variety.

Another mode belong to this head, is that of place. Our idea of place is nothing but the relative position of any thing with reference to its distance from some fixed and certain points. Whence we say, that a thing has or has not changed place, when its distance either is or is not altered with respect to those bodies which which we have occasion to compare it. That this is so, we may easily gather from hence, that we can have no idea of the place of the universe, though we can of all its parts. To say that the world is somewhere, means no more than that it does exist. The word place is sometimes taken to signify that space which any body takes up; and so the universe may be conceived in a place.

Of duration, and its simple modes.

There is another sort of distance, the idea of which we get from the fleeting and perpetually perishing parts of succession, which we call duration. The simple modes of it are any different lengths of it whereof we have distinct ideas; as hours, days, years, &c. time, and eternity.

The idea of succession is got by reflecting on that train of ideas which constantly follow one another in our minds as long as we are awake. The distance between any parts of this succession, is what we call duration; and the continuance of the existence of ourselves, or any thing else, common to the succession of any ideas in our minds, is what we call our own duration, or that of another thing co-existing with our thinking. That this is so, appears from hence, that we have no perception of succession or duration, when that succession of our ideas ceases, as in sleep; the moment that we sleep, and awake, how distant ever, seems to be joined and connected. And possibly it would be so to a waking man, could he fix upon one idea without variation and the succession of others. And we see that they whose thoughts are very intent upon one thing, let slip out of their account a good part of that duration, and think that time shorter than it is. But if a man, during his sleep, dream, and a variety of ideas make themselves perceptible in his mind one after another, he hath then, during such dreaming, a sense of duration, and of the length of it.

A man having once got this idea of duration, can apply it to things which exist while he does not think: and thus we measure the time of our sleep, as well as that wherein we are awake.

Duration, as marked by certain periods and measures, is what we most properly call time, which we measure by the diurnal and annual revolutions of the sun, as being constant, regular, and universally observable by all mankind, and supposed equal to one another.

The mind having once got such a measure of time, as the annual revolution of the sun, can easily apply it to duration, wherein that measure itself did not exist; and the idea of duration equal to an annual revolution of the sun, is as easily applicable in our thoughts to duration where no sun nor motion was, as the idea of a foot or yard to distances beyond the confines of the world.

By the same means, and from the same original that we come to have the idea of time, we have also that idea which we call eternity: for having got the ideas of certain lengths of duration, we can in our thoughts add them to another, as off we please, without ever coming to an end.

And thus it is plain, that from the two fountains of all knowledge before mentioned, viz. sensation and reflection, we get the ideas of duration, and the several measures of it.

Of numbers.

The complex ideas of number are formed by adding several units together. The simple modes of it are each several combinations, as two, three, &c. These are of all others most distinct, the nearest being as clearly different from each other as the most remote: two being as distinct from one, as two hundred. But it is hard to form distinct ideas of every the least excess in extension. Hence demonstrations in numbers are more general in their use, and more determinate in their application, than those of extension.

Simple modes of numbers being in our minds but so many combinations of units, which have no variety but more or less; names for each distinct combination seem more necessary than in any other sort of ideas: For without a name, or mark, to distinguish that precise collection, it will hardly be kept from being a heap of confusion. Hence some Americans have no distinct idea of any number beyond twenty; so that when they are dispersed with of greater numbers, they shew the hairs of their head. So that to reckon right, two things are required: First, That the mind distinguish carefully two ideas which are different one from another only by the addition or subtration of one unit.

Secondly, That it retain in memory the names or marks of the several combinations, from an unit to that number; and that in exact order, as they follow one another. In either
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Shewing the manner in which natural bodies, confidered in a chemical view, may be divided into classes; With their several subdivisions; their properdes defined; and the manner in which they are obtained, pointed out.

Aucides. There are di-
Inflammables, or volatile fluids, emitting noxious fumes when in a concentrated state. The non-acidic fluids in the following table are divided into simple and compound.

Simples, are those which are not decomposed by the chemist; and are of two sorts, viz.

Constitute, or compound fluids, formed of chemical elements.

1. SOLVENTS. Their are soluble in water, and not inflammable. They are divided into

Acids. They are di-
Solvent fluids, or those which can be no

Compounds, consisting of two or more

Nitrates, or Arsenic. A volatile fluid of a reddish colour, emitting noxious fumes when in a concentrated state.

Nitrous, or Aquafortis. A volatile fluid of a beautiful yellow colour, inferior in power to the former. Obtained from saltpetre.

Mercuric, or quick-silver. A powerful fluid, emitting noxious and inflammable fumes when in a concentrated state.

Platina. A white semimetal, resembling silver in its lustre; nearly of the same specific gravity and fixity with gold, and resisting the effects which have usually been applied for discovering the purity of gold, supposed from the elution of waters impregnated with saline substances; the diversity of which is exceeding great; but they all agree in having an acid joined with them.

Lime-stone, or marble. This is of infinite variety of colours and texture. Marble is the hardest and finest. Those kinds of lime-stone which feel asperous to the touch are generally impregnated with or

Common clay, is of many different colours, but chiefly red or yellow or white. The purest clay is that which burns white in the fire. This is probably nothing else than lime-stone calcaneus. Clay of any kind may, by a particular process, be converted into quick-lime. This is probably nothing else than lime-stone calcaneus.

Lapis nephriticus, or steatite, is an indurated clay, found in various parts. These are at first soft, and readily cut; but turn extremely hard in the air. Many other varieties of these earths might be

Salt, or as is called in the antique language. The earth of animals, dye. This is obtained by the calcination of animal-substances.

Chalk. A soft, friable, white substance. This is much freer of any heterogeneous mixture than any lime-stone, and is easily calcined into quick-lime. This is probably nothing else than lime-stone calcaneus.

Earth of vegetables, or black-stone. A consolidated earth, found in many places impregnated with saline substan-

Earth of animals, or caffeine. Obtained from the allies of burnt vegetables. A deliquescent salt.

Acid of borax, or sediment salt. Obtained from borax, in a solid form and friable-like form.

Acid of oxalic, or adipic acid. Obtained from all animal-substances in dissillation.

Acids. The finest form of acids is that of a very slight fluid, which is the finest form of acids in water.

Acid of saltpetre. Obtained from all vegetable acids are much less corrosive, and is powerful as a solvent.
A TABLE showing the several combinations that THE SIMPLE CHEMICAL ELEMENTS admit of with one another; the compound resulting from that mixture; and the manner in which the union is effected: With some account of the principal offices to which these are applied in arts or manufactures.

| N. B. | This mark *, put above any word, declares that there is some difficulty in the passage, or that the union is not very complete. |

### ALCOHOL.

**Sulphur.** Here there is no proper union of substances: but if sulphur is boiled in this acid, it becomes less inflammable and more fixed than any ordinary sulphur. It is not volatile so far as common sulphur is, but is easily distilled after its being added by the addition of water. Since water and alcohol are two fluids, the mixture is very combustible. By solution. By boiling the heat after the other has risen. By boiling until the solution becomes very volatile. A medicine much celebrated by Hoffman. By solution, sublating the alcohol. Boil. By a substance reduced like alcohol. A thick fluid. By solution after precipitation from the liquor in solution. This mixture has no name, nor is it applied to any remarkable use in arts.

### ACIDS.

**Nitrous acid.** By solution from the nitrous acid by alkalis. When once precipitated, it is again precipitated by a very strong solution.

### SEMI-METALS.

**Tin.** By solution from the nitrous acid by alkalis. The solutions which arise from the nitrous acid by alcohol.

### EARTHS.

**Clay.** By solution in boiling heat, and repeated corrosions with fresh acid, when evaporated.

### OILS.

**Sulphur.** By nufhmg* the heat after the oil comes over. It is to be observed that this is produced in every combination of this acid with inflammable or combustible bodies.

### METALS.

**Gold.** Imperfectly. By a particular process after being separated from aqua regia. Stannous chloride. By boiling the gold with the nitrous acid by alcohol. The forms which arise in this solution are inflammable.

### ALKALIS.

**Ammonium.** By boiling in the nitrous acid by alcohol. A more violent heat is generated upon the mixture of these acids with any other, and with many of them mutual fluids are produced. Applied to no particular use.

### MEALS.

**Alcohol.** By the ordinary method of dissolving copper from gold by the nitrous acid. It forms a profound liquid.

### SULPHUR.

**A.** By solution after precipitation from the nitrous acid.

### NITRIC ACID.

**Gold.** By solution after precipitation from the nitrous acid by alkalis. The fumes which arise in this solution are inflammable.

### VITRIC-ACID.

**Gold.** By solution after precipitation from a very dilute solution of chalk in the nitrous acid by alcohol. The solutions which arise from the nitrous acid by alcohol.

### VEGETABLE.

**Vegetable.** By the ordinary method of dissolving copper from gold by the nitrous acid. It forms a profound liquid.

### ALKALIS.

**Ammonium.** By boiling in the nitrous acid by alcohol. A more violent heat is generated upon the mixture of these acids with any other, and with many of them mutual fluids are produced. Applied to no particular use.

### ACIDS.

**Nitrous acid.** By solution from the nitrous acid by alkalis. When once precipitated, it is again precipitated by a very strong solution.

### SEMI-METALS.

**Tin.** By solution from the nitrous acid by alkalis. The solutions which arise from the nitrous acid by alcohol.
The content of the image appears to be a page from a book or a document discussing various acids, alkalis, and metals, along with their properties and uses. The text includes detailed descriptions of each substance, their reactions, and their applications. The page seems to be part of a larger discussion on chemistry, focusing on the interactions between different substances and their characteristics.

For example, the text mentions acids such as Vitriolic, Nitrous, Muriatic, Vegetable, and acid of Urine, of Amber, of Ants, of Borax, and others. These acids are paired with alkalis, metals, and other substances, highlighting their combinations and reactions. The page also includes a table with various substances and their properties, indicating a structured approach to the subject matter.

The document is rich in scientific detail, suitable for students or individuals with a strong interest in chemistry or related fields. It aims to provide a comprehensive overview of the topic, covering a wide range of substances and their interactions.
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<table>
<thead>
<tr>
<th>METAL</th>
<th>ACIDS:</th>
<th>Bases:</th>
<th>Solvents:</th>
<th>Phenomena:</th>
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<tbody>
<tr>
<td>NICKEL</td>
<td>Virgule, Nitrate, Murphite, Vegetable, of Uranium, of Amber, of Ams, as above.</td>
<td>Fixt.</td>
<td>Alcohol, metals, semi-metals, earths, and water.</td>
<td>With the phenomena, and by the means mentioned above.</td>
</tr>
<tr>
<td>COBALT</td>
<td>Virgule, Nitrate, Murphite, Vegetable, of Uranium, of Amber, of Ams, as above.</td>
<td>Fixt. and Volatile, as above.</td>
<td>Alcohol, metals, semi-metals, earths, and water.</td>
<td>With the phenomena, and by the means mentioned above.</td>
</tr>
<tr>
<td>PLATINA</td>
<td>Fixt.</td>
<td>Antimony, Muriatic, Vegetable, of Uranium, of Amber, of Ams, as above.</td>
<td>Alcohol, metals, semi-metals, earths, and water.</td>
<td>With the phenomena, and by the means mentioned above.</td>
</tr>
<tr>
<td>BISMUTH</td>
<td>Fixt.</td>
<td>Antimony, Muriatic, Vegetable, of Uranium, of Amber, of Ams, as above.</td>
<td>Alcohol, metals, semi-metals, earths, and water.</td>
<td>With the phenomena, and by the means mentioned above.</td>
</tr>
<tr>
<td>ARSENIC</td>
<td>Fixt.</td>
<td>Antimony, Muriatic, Vegetable, of Uranium, of Amber, of Ams, as above.</td>
<td>Alcohol, metals, semi-metals, earths, and water.</td>
<td>With the phenomena, and by the means mentioned above.</td>
</tr>
<tr>
<td>ZINC</td>
<td>Fixt.</td>
<td>Antimony, Muriatic, Vegetable, of Uranium, of Amber, of Ams, as above.</td>
<td>Alcohol, metals, semi-metals, earths, and water.</td>
<td>With the phenomena, and by the means mentioned above.</td>
</tr>
</tbody>
</table>

**Iron (Fe)**

- **Iron** appears as a metal that can be combined with various acids, bases, and solvents to form different compounds.
- **Antimony** is mentioned as a base that can be combined with iron.

**Semi-Metals**

- **Semi-metals** such as Antimony, Bismuth, Arsenic, and Cobalt are also listed with their associated phenomena and methods of preparation.

**Vitreous Earths**

- Vitreous earths are described as forming a glassy substance when heated.

**Absorbent Earths**

- Absorbent earths are noted for their ability to absorb certain substances.

**Platinum**

- Platinum is noted for its particular qualities that make it suitable for certain applications.

**Magnificent Earth**

- Magnificent earth is described as having a distinctive luster and color.

**Explanations of the Tables**

The tables provided offer various chemical combinations and their results. Each entry includes information on how to prepare the substance, its properties, and its reactions with different elements.
Each different space; and each mode of this is.

When these ide, they can in their without joining themselves the the utmost bound one to another, they please. For distance, without come by the ide

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dies, whole ext eye takes both f are within its vi terminate either ble angles, or it perceived; by e ther in all parts it has that idea infinite variety.

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The idea of, of ideas which c as long as we parts of this suc continuation of elfe, commensur minds, is what ther thing co-exi appears from he cession or durat ceafes, as in the wake, how diff red. And possi he fix upon on fion of others.
either of which if it fails, the whole business of numbering will be disturbed; and there will remain only the confused idea of multitude; but the ideas necessary to distinct numeration will not be attained to.

Of infinity.

The idea signified by the name infinity, is best examined, by considering what infinity is by the mind attributed, and then how it frames it. Finite and infinite, then, are looked upon as the modes of quantity, and attributed primarily to things that have parts, and are capable of increase or diminution by the addition or subtraction of any the least part. Such are the ideas of space, duration, and number.

When we apply this idea to the Supreme Being, we do it primarily, in respect of his duration and ubiquity; more figuratively, when to his wisdom, power, goodness, and other attributes, which are properly inexhaustible and incomprehensible: For when we call infinite, we have no other idea of this infinity, but what carries with it some reflection on the number or the extent of the acts or objects of God's power and wisdom, which can never be suppos'd so great, or so many, that these attributes will not always abound and exceed, though we multiply them in our thoughts with the infinity of endless number.

The next thing to be considered, is, how we come by the idea of infinity. Every one that has any idea of any flated lengths of space, as a foot, yard, &c. finds that he can repeat that idea, and join it to another, to a third, and so on without ever coming to an end of his additions. From this power of enlarging his idea of space, he takes the idea of infinite space, or immensity. By the same power of repeating the idea of any length of duration we have in our minds, with all the endless addition of number, we come by the idea of eternity.

If our idea of infinity be got by repeating without end our own ideas; why do we not attribute it to other ideas, as well as those of space and duration; since they may be as edifying and as often repeated in our minds, as the other? Yet no body ever thinks of infinite sweetness or whiteness, though he can repeat the idea of sweet or white as frequently as those of yard or day. But those ideas that have parts, and are capable of increase by the addition of any parts, afford us, by their repetition, an idea of infinity; because with the endless repetition there is continued an enlargement, of which there is no end. But it is not so in other ideas: For if to the perfect idea I have of white, I add another of equal whiteness; it enlarges not my idea at all. Those ideas that consist not of parts, cannot be augmented to what proportion men please, or be stretched beyond what they have received by their senses: But space, duration, and number, being capable of increase by repetition, leave in the mind an idea of an endless room for more; and so these ideas alone lead the mind towards the thought of infinity.

Of the modes of thinking.

When the mind turns its view inwards upon itself, thinking is the first idea that occurs: Wherein it observes a great variety of modifications; and thereof frames to

Of the modes of pleasure and pain.

Pleasure and pain are simple ideas, which we receive both from sensation and reflection. There are thoughts of the mind, as well as sensations, accompanied with pleasure or pain. Their causes are termed good or evil. Pleasure and pain, and their causes good and evil, are the hinges upon which our passions turn; by reflecting on the various modifications or tempers of mind, and the internal sensations which pleasure and pain, good and evil, produce in us, we may thence form to ourselves the ideas of our passions. Thus by reflecting upon the thought we have of the delight which any thing is apt to produce in us, we have an idea we call love: And on the contrary, the thought of the pain which any thing present or absent produces in us, is what we call hatred. Desire is that uneasiness which a man finds in himself upon the absence of any thing the present enjoyment of which carries the idea of delight with it. Joy is a delight of the mind arising from the present or aspired approaching possession of a good. Sorrow is an uneasiness of the mind, upon the thought of a good lost, or the sense of a present evil. Hope is a pleasure in the mind, upon the thought of a probable future enjoyment of a thing which is apt to delight. Fear is an uneasiness of the mind, upon the thought of a future evil likely to befall us. Anger is a discomposure of mind, upon the receipt of injury, with a present purpose of revenge. Disgust is the thought of the unattainableness of any good. Envy is an uneasiness of mind, caused by the consideration of a good we desire, obtained by one we think should not have had it before us.

It is to be considered, that in reference to the passions, the removal or lessening of a pain, is considered as a pleasure; and the loss or diminishing of a pleasure, as a pain. And farther, that the passions in most persons operate on the body, and cause various changes in it; but these being not always sensible, do not make a necessary part of the idea of each passion.

Of power.

The mind being every day informed by the senses of the alteration of those simple ideas, it observes in things without, reflecting also on what passes within itself, and

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observing a constant change of its ideas, sometimes by the impressions of outward objects upon the senses, and sometimes by the determination of its own choice; and concluding, from what it has so constantly observed to have been, that the like changes will for the future be made in the same things, by the same agents, and by the like ways, considers in one thing the possibility of having any of its simple ideas changed, and in another the possibility of making that change, and so comes by that idea which we call power. Thus we say fire has a power to melt gold, and make it fluid; and gold has a power to be melted.

Power thus considered, is twofold, viz. as able to make, or as able to receive any change: the one may be called active, the other passive power. Of passive power all sensible things abundantly furnish us with ideas, whose sensible qualities and beings we find to be in a continual flux. Nor have we of active power fewer instances; since whatever change is observed, the mind must collect a power somewhere able to make that change. But yet, if we will consider it attentively, bodies by their senses do not afford us so clear and distinct an idea of active power as we have from reflection on the operations of our minds. For all power relating to action, and being but two sorts of action, viz. thinking and motion, let us consider whence we have the clearest ideas of the powers which produce these actions.

Of thinking, body affords us no idea at all: It is only from reflection that we have that; neither have we from body any idea of the beginning of motion. A body at rest, affords us no idea of any active power to move; and when it is set in motion itself, that motion is rather a passion than an action in it. The idea of the beginning of motion, we have only by reflection on what passes in ourselves; where we find by experience, that barely by willing it, we can move the parts of our bodies which were before at rest.

We find in ourselves a power to begin or forbear, continue or end, several actions of our minds, and motions of our bodies, barely by a thought, or preference of the mind. This power which the mind has thus to order the consideration of any idea, or the forbearing to consider it; or to prefer the motion of any part of the body to its rest, and vice versa, in any particular instance, is that we call the will; the actual exercise of that power is what we call volition, or willing. The forbearance or performance of that action, consequent to such order or command of the mind, is called voluntary; and whatsoever action is performed without such a thought of the mind, is called involuntary.

The power of perception is that we call the understanding. Perception, which we make the act of the understanding, is of three sorts: 1. The perception of ideas in our minds, 2. The reception of signs, 3. The perception of the agreement or disagreement of any distinct ideas. These powers of the mind, viz. of perceiving and preferring, are usually called by another name; and the ordinary way of speaking is, that the understanding and will are two faculties of the mind.

From the consideration of the extent of the power of the mind over the actions of the man, which every one finds in himself, arise the idea of liberty and necessity: so far as a man has a power to think or not to think, to move or not to move, according to the preference or direction of his own mind, so far is a man free. Whenever any performance or forbearance are not equally in a man's power; where-ever doing, or not doing, will not equally follow upon the preference of his mind; there he is not free, though perhaps the action may be voluntary. So that the idea of liberty, is the idea of a power in any agent to do or forbear any action, according to the determination or thought of the mind whereby either of them is preferred to the other. Where either of them is not in the power of the agent to be produced by him, according to his volition, there he is not at liberty; that agent is under necessity. So that liberty cannot be where there is no thought, no volition, no will; but there may be thought, there may be will, there may be volition, where there is no liberty. Thus a tennis-ball, whether in motion by the stroke of a racket, or lying still at rest, is not by any one taken to be a free agent. So a man striking himself or his friend by a convulsive motion of his arm, which it is not in his power by volition or the direction of his mind to stop or forbear; no body thinks he has in this liberty: every one pities him, as acting by necessity and constraint. Again, suppose a man be carried whilft fast asleep into a room, where is a person he longs to see, and be there locked fast in, beyond his power to get out; he awakes, and is glad to see himself in so desirable company; which he flays willingly in, that is, prefers his staying to going away. Is not this stay voluntary? no body will doubt it; and yet being locked fast in, he is not at liberty to stay, he has not freedom to be gone. So that liberty is not an idea belonging to volition or preferring, but to the person having the power of doing, or forbearing to do, according as the mind shall chuse or direct.

As it is in the motions of the body, so it is in the thoughts of our minds: where any one is such, that we have power to take it up, or lay it by, according to the preference of the mind, there we are at liberty. A waking man is not at liberty to think, or not to think, no more than he is at liberty whether his body shall touch any other or no: But whether he will remove his contemplation from one idea to another, is many times in his choice. And then he is, in respect of his ideas, as much at liberty, as he is in respect of bodies he rests on. He can at pleasure remove himself from one to another: but yet some ideas to the mind, like some motions to the body, are such, as in certain circumstances it cannot avoid, nor obtain their absence by the utmost effort it can use. Thus a man on the rack is not at liberty to lay by the idea of pain, and entertain other contemplations.

Where ever thought is wholly wanting, or the power to act or forbear according to the direction of thought, there necessity takes place. This in an agent capable of volition, when the beginning or continuance of any action is contrary to the preference of his mind, is called compulsion: when the hindering or stopping any action is contrary to his volition, it is called restraint: Agents that have no thought, no volition at all, are in every thing necessary agents.
Mixed modes are combinations of simple ideas of different kinds. The mind being once furnished with simple ideas, can put them together in several compositions, without examining whether they exist fo together in nature. And hence it is, that these ideas are called notions, as if they had their original and constant existence more in the thoughts of men, than in the reality of things: and to form such ideas, it sufficed that the mind put the parts of them together, and that they were constant in the understanding, without considering whether they had any real being. There are three ways whereby we get these complex ideas of mixed modes.

1st, By experience, and observation of things themselves: Thus by seeing two men wrestle, we get the idea of wrestling.

2dly, By invention, or voluntary putting together of several simple ideas in our own minds: So he that first invented printing, had an idea of it first in his mind before it ever evinced.

3dly, By explaining the names of actions we never saw, or nations we cannot see; and by enumerating all those ideas which go to the making them up. Thus the mixed mode, which the word lie stands for, is made up of these simple ideas: 1st, Articulate sounds. 2dly, Certain ideas in the mind of the speaker. 3dly, Those words, the signs of those ideas. 4thly, Those signs put together, by affirmation or negation, otherwise than the ideas they stand for are in the mind of the speaker. Since languages are made, complex ideas are usually got by the explanation of those terms that stand for them: for since they consist of simple ideas combined, they may, by words standing for those simple ideas, be represented to the mind of one who understands those words; though that combination of simple ideas was never offered to his mind by the real existence of things.

Mixed modes have their unity from an act of the mind, combining those several simple ideas together, and considering them as one complex one: the mark of this union is a certain name given to that combination. Men seldom reckon any number of ideas to make one complex one: but such collections as there be names for. Thus the killing of an old man, is as fit to be united into one complex idea, as that of a father; yet there being no name for it, it is not taken for a particular complex idea, nor a distinct species of action from that of killing any other man.

Those collections of ideas have names generally affixed, which are of frequent use in conversation: in which calls men endeavor to communicate their thoughts to one another with all possible dispatch. Those others, which they have seldom occasion to mention, they tie not together, nor give them names.

This gives the reason, why there are words in every language, which cannot be rendered by any one single word of another. For the fashions and customs of one nation make several combinations of ideas familiar in one, which another had never any occasion to make. Such were οργανικὰς among the Greeks, proscriptio among the Romans. This also occasions the constant change of languages; because the change of custom and opinions brings with it new combinations of ideas, which, to avoid long descriptions, have new names annexed to them, and so they become new species of mixed modes.

Of all our simple ideas, those that have had most mixed modes made out of them, are thinking, and motion; which comprehend in them all action; and power, from whence these actions are conceived to flow. For actions being the great business of mankind, it is no wonder, if the several modes of thinking and motion should be taken notice of, the ideas of them observed and laid up in memory, and have names assigned them. For without such complex ideas with names to them, men could not easily hold any communication about them. Of this kind are the modes of actions distinguished by their causes, means, objects, ends, instruments, time, place, and other circumstances; as also of the powers fitted for those actions: thus boldness is the power to do or speak what we intend, without fear or disorder; which power of doing anything, when it has been acquired by the frequent doing the same thing, is that idea we call habit; when forward, and ready upon every occasion, to break into action, we call it disposition; thus testimony is a disposition or aptness to be angry.

Power being the source of all action, the substances wherein these powers are, when they exert this power, are called causes; and the substances thereupon produced, or the simple ideas introduced into any subject, effects. The efficacy whereby the new substance or idea is produced, is called, in the subject exerting that power, action; in the subject, wherein any simple idea is changed, or produced, passion: Which efficacy, in intellectual agents, we can conceive to be nothing else but powers of thinking and willing; in corporeal agents, nothing else but modifications of motion.

Of our complex ideas of substances.

The mind observing several simple ideas to go constantly together, which being presumed to belong to one thing, are called, in united in one subject, by one name, which we are apt afterward to talk of and consider as one simple idea, which indeed is a composition of many ideas together. We imagine not these simple ideas to subsist by themselves; but suppose some substratum whereon they subsist, which we call substance. The idea of pure substance is nothing but the supposed (but unknown) support of those qualities, which are capable of producing simple ideas in us.

The ideas of particular circumstances are composed out of this obscure and general idea of substance, together with such combinations of simple ideas as are observed to exist together, and supposed to flow from the internal constitution and unknown essence of that substance. Thus we come by the idea of man, horse, gold, &c. Thus the sensible qualities of iron, or a diamond, make the complex idea of those substances, which a smith or a jeweller commonly knows better than a philosopher.

The same happens concerning the operations of the mind, viz. thinking, reasoning, &c. which we concluding not to subsist by themselves, nor apprehending how they can belong to body, or be produced by it, we think
them the actions of some other substance, which we call spirit; of whose substance or nature we have as clear a notion as of that of body; the one being but the supposed substratum of the simple ideas we have from without, as the other of those operations which we experiment in ourselves within: So that the idea of corporeal substance in matter, is as remote from our conceptions as that of spiritual substance.

Hence we may conclude, that he has the perfect idea of any particular substance, who has collected most of the simple ideas which do exist in it; among which he is to reckon its active powers and passive capacities, though not frivolously simple ideas.

Secondary qualities, for the most part, serve to distinguish substances. For our senses fail us in the discovery of the bulk, figure, texture, &c. of the minute parts of bodies, on which their real constitutions and differences depend; and secondary qualities are nothing but powers, with relation to our senses. The ideas that make our complex ones of corporeal substances, are of three sorts: First, The ideas of primary qualities of things, which are discovered by our senses; such are bulk, figure, motion, &c. Secondly, The sensible secondary qualities; which are nothing but powers to produce several ideas in us by our senses. Thirdly, Tha aptness we consider in the juxta-position of discernible parts, we call kingdom and unking and subject to the view from the comparison of one thing with another. Thus when we give men names, we agree in that of father.

There is no idea of any kind, which is not capable of an almost infinite number of considerations, in reference to other things; and therefore this makes no small part of mens words and thoughts. Thus one single man may at once sustain the relations of father, brother, son, husband, friend, subject, master, servant, bigger, less. And as to an almost infinite number; he being capable of as many relations, as there may be occasions of comparing him to other things in any manner of agreement, disagreement, or respect whatsoever.

Of cause and effect, and other relations.

Of cause and effect we get from our observation of the vicissitude of things, while we perceive some qualities or substances begin to exist, and that they receive their existence from the due application and operation of other beings: That which produces, is the cause; that which is produced, the effect. Thus fluidity in wax is the effect of a certain degree of heat, which we observe to be constantly produced by the application of such heat.

We distinguish the originals of things into two sorts. First, When the thing is wholly made new, so that no part thereof did ever exist before, as when a new particle of matter doth begin to exist which had before no being, it is called creation.

Secondly, When a thing is made up of particles which did all of them before exist, but the thing so constituted of pre-existing particles, which all together make up such a collection of simple ideas, had not any existence before, as this man, this egg, this rose, &c. this, when referred to a substance produced in the ordinary course of nature by an internal principle, but first on work by some external agent, and working by insensible ways which we perceive not, is called generation. When the cause is extrinsic, and the effect produced by a sensible separation, or juxta-position of discernible parts, we call it making; and such are all artificial things. When any simple idea is produced,
The denominations of things taken from time, are for the most part only relations. Thus when it is said that Queen Elizabeth lived sixty-nine, and reigned forty-five years, no more is meant, than that the duration of her existence was equal to sixty-nine, and of her government to forty-five annual revolutions of the sun.

Young and old, and other words of time, that are thought to stand for positive ideas, are indeed relative; and intimate a relation to a certain length of duration, whereof we have the idea in our minds. Thus we call a man young or old, that has lived little or much of that time that men usually attain to. This is evident from our application of these names to other things; for a man is called young at twenty, but a horse old, &c. The fun and stars we call not old at all, because we know not what period God has set to that sort of beings.

There are other ideas, that are truly relative, which we signify by names that are thought positive and absolute; such as great and little, strong and weak. The things thus denominated, are referred to some standards, with which we compare them. Thus we call an apple great, that is bigger than the ordinary sort of wholesome we have used to; and a man weak, that has not so much strength of power to move, as men usually have.

Of identity and diversity.

Another occasion the mind takes of comparing, is the very being of things. When considering a thing as existing at any certain time, or place, and comparing it with itself as existing at any other time, &c. it forms the idea of identity and diversity. When we fix any thing in any certain time and place, we are sure it is that very thing, and can be no other, how like forever it may be in all other respects.

We conceiving it impossible that two things of the same kind should exist together in the same place, we conclude, that whatever exists any where at the same time, excludes all of the same kind, and is there itself alone. When therefore we demand whether any thing be the same, or no, it refers always to something that existed such a time, in such a place, which it was certain at that instant was the same with itself and no other.

We have ideas of three sorts of substances: 1st, Of God; 2dly, Finite intelligent beings; 3dly, Bodies.

Firstly, God being eternal, unalterable, and everywhere, concerning his identity there can be no doubt.

Secondly, Finite spirits having had their determinate time and place of beginning to exist, the relation to that time and place will always determine to each its identity, as long as it exists.

Thirdly, The same will hold of every particle of matter to which no addition or subtraction is made. These three exclude not one another out of the same place, yet each exclude those of the same kind out of the same place.

The identity and diversity of modes and relations are determined after the same manner that substances are; only the actions of finite beings, as motion and thought, consisting in succession, they cannot exist in different times and places as permanent beings: for no motion or thought, considered as at different times, can be the same, each part thereof having a different beginning of existence.

From whence it is plain, that existence itself is the principium individuationis, which determinates a being to a particular time and place incommunicable to two beings of the same kind. Thus, suppose an atom existing in a determined time and place; it is evident that, considered in any instant, it is the same with itself, and will be so long as its existence continues. The name may be said of two, or more, or any number of particles, whilst they continue together. The mass will be the same, however jumbled; but if one atom be taken away, it is not the same mass.

In vegetables, the identity depends not on the same mass, and is not applied to the same thing. The reason of this, is the difference between an animate body and mass of matter; this being only the cohesion of particles any how united; the other, such a disposition, an organization of parts, as is fit to receive and distribute nourishment, so as to continue and frame the wood, bark, leaves, &c. (of an oak, for instance) in which consists the vegetable life. That therefore which has such an organization of parts partaking of one common life, continues to be the same plant, though that life be communicated to new particles of matter, vitally united to the living plant.

The case is not so much different in brutes, but that any one may hence see what makes an animal, and continues it the same.

The identity of the same man likewise consists in a participation of the same continued life in succeeding particles of matter vitally united to the same organized body.

To understand identity aright, we must consider what idea the word is applied to stands for; it being one thing to be the same substance, another the same man, and a third the same person.

An animal is a living organized body; and the same animal is the same continued life communicated to different particles of matter, as they happen successively to be united to that organized living body; and our notion of man is but of a particular sort of animal.

Person stands for an intelligent being, that reasons and reflects, and can consider itself the same thing in different times and places; which it doth by that consciousness that is inseparable from thinking. By this every one is to himself what he calls self, without considering whether that self be continued in the same or divers substances. In this consists personal identity, or the sameness of a rational being; and so far as this consciousness extends backward to any past action or thought, so far reaches the identity of that person. It is the same self now, it was then: And it is by the same self, with this present one that now reflects on it, that that action was done.

Self is that conscious thinking thing, whatever subsistence it matters not, which is conscious of pleasure or pain, capable of happiness or misery; and is concerned for itself as far as that consciousness extends. That with which the consciousness of this present thinking thing can join itself, makes the same person, and is one self with it; and so attributes to itself and owns all the actions of that thing as its own, as far as that consciousness reaches.
This personal identity is the subject of reward and punishment, being that by which every one is concerned for himself. If the consciousness went along with the little finger, when that was cut off, it would be the same self that was just before concerned for the whole body.

If the same Socrates, waking and sleeping, did not partake of the same consciousness, they would not be the same person. Socrates waking, could not be in justice accountable for what Socrates sleeping did. Now no more than one twin for what his brother twin did because their outsides were so like that they could not be distinguished.

But suppose I wholly lose the memory of some parts of my life, beyond a possibility of retrieving them, so that I shall never be conscious of them again: Am I not the same person that did those actions, though I have now forgotten them? I answer, that we must here take notice what the word I is applied to, which in this case is the man only: And the same man being presumed to be the same person, I is easily here supposed to stand also for the same performer. But if it be possible for the same man to have different incommunicable consciousness at different times, it is past doubt the same man would, at different times, make different persons. Which we see is the sense of mankind in the solemn declaration of their opinions, human laws not punishing the mad man for the sober man's actions, nor the sober man for what the mad man did; thereby making them two persons. Thus we say in English, such a one is not himself, or is beside himself; in which phrase it is inculcated, that self is changed, and the self-same person is no longer in that man.

But is not a man drunk or sober the same person? Why else is he punished for the same fact he commits when drunk, though he be never afterwards conscious of it? Just as much the same person, as a man that walks and does other things in his sleep is the same person, and is as answerable for any mischief he shall do in it. Human laws punish both with a justice suitable to their way of knowledge: Because in these cases they cannot distinguish certainly what is real, and what is counterfeit. And so the ignorance in drunkenness or sleep, is not admitted as a plea: For though punishment be annexed to personality, and personality to consciousness; and the drunkard, perhaps, is not conscious of what he did; yet human judges justly punish him, because the fact is proved against him, but want of consciousness cannot be proved for him.

To conclude: Whatever substance begins to exist, it must during its existence be the same. Whatever compositions of substances begin to exist, during the union of those substances, the concrete must be the same. Whatever mode begins to exist, during its existence it is the same. And so if the composition be of different substances, and different modes, the same rule holds.

Of other relations.

All simple ideas, wherein are parts or degrees, afford an occasion of comparing the subjects wherein they are to one another, in respect of those simple ideas. As

habiter, sweeter, more, left, &c. These depending on the equality and excess of the same simple ideas, in several subjects, may be called proportional relations.

Another occasion of comparing things is taken from the circumstances of their origin, as father, son, brother, &c. These may be called natural relations.

Sometimes the foundation of considering things, is some act whereby any one comes by a moral right, power, or obligation to do something: Such are general, captain, burgber; these are instituted and voluntary relations, and may be distinguished from the natural, in that they are alterable and separable from the persons to whom they sometimes belonged, though neither of the substances so related be destroyed: But natural relations are not alterable, but are as lasting as their subjects.

Another relation is the conformity or disagreement of men voluntary actions to a rule to which they are referred, and by which they are judged off: These may be called moral relations. It is this conformity or disagreement of our actions to some law (whereby good or evil is drawn on us from the will and power of the law-maker, and is what we call reward or punishment) that renders our actions morally good or evil.

Of these moral rules or laws, there seem to be three sorts, with their different enforcements: First, The divine law; secondly, Civil law; thirdly, The law of opinion or reputation. By their relation to the first, our actions are either sins or duties; to the second, criminal or innocent; to the third, virtues or vices.

Firstly, The divine law, is that law which God has set down to the actions of men, whether promulgated to them by the light of nature, or the voice of revelation.

That God has given a law to mankind, seems undeniable; since he has, first, A right to do it; we are his creatures. Secondly, Goodness and wisdom, to direct our actions to what is best. Thirdly, Power to enforce it by reward, and punishment: of infinite weight and duration. This is the only true touch-stone of moral rectitude; and by which men judge of the most considerable moral good or evil of their actions; that is, whether, as duties or sins, they are like to procure to them happiness or misery from the hands of the Almighty.

Secondly, The civil law is the rule fet by the commonwealth to the actions of those that belong to it. This law nobody over-looks; the rewards and punishments being ready at hand to enforce it, extending to the protecting or taking away of the life, liberty, and estate of those who observe or disobey it.

Thirdly, The law of opinion, or reputation. Virtue and vice are names supposed every where to stand for actions in their own nature right and wrong. As far as they are really so applied, they so far are coincident with the divine law. But it is visible that these names in the particular instances of their application, through the several nations and societies of men, are constantly attributed only to such actions as in each country and society are in reputation or disrepute. So that the measure of what is everywhere called and esteemed virtue and vice, is the approbation or disapprobation, or dislike, praise or blame, which by a tacit consent establishes itself in the societies and tribes of men in the world;
world; whereby several actions come to find credit or disgrace among them, according to the judgment, maxims, or fashions of the place.

That this is so, appears hence: That though that passes for virtue in one place, which is elsewhere accounted vice, yet every where virtue and praise, vice and blame, go together: Virtue is every where that which is thought praise worthy; and nothing else but that which has the allowance of public esteem, is called virtue. These have so close an alliance, that they are often called by the same name.

It is true, virtue and vice do, in a great measure, everywhere correspond with the unchangeable rule of right and wrong, which the laws of God have established; because the observance of these laws visibly secures and advances the general good of mankind, and the neglect of them breeds mischief and confusion: And therefore men, without renouncing all sense and reason, and their own interest, could not generally mistake in placing their commendation and blame on that side that deferred it not.

They who think commendation and disgrace not sufficient motives to engage men to accommodate themselves to the opinions and rules of those with whom they converse, seem little skilled in the history of mankind; the greatest part of which govern themselves chiefly by this law of fashion.

The penalties that attend the breach of God's laws are seldom seriously reflected on; and those that do reflect on them entertain thoughts of future reconciliation; and for the punishment due from the laws of the commonwealth, men flatter themselves with the hopes of impunity: But no man escapes censure and dislike, who offends against fashion; nor is there one of a thousand stiff and infensible enough, to bear up under the constant dislike and condemnation of his own club.

Morality then is nothing but a relation to these laws or rules: And these rules being nothing but a collection of several simple ideas, the conformity thereto is but so ordering the action, that the simple ideas belonging to it may correspond to those which the law requires. By which we see, how moral beings and notions are found on, and terminated in the simple ideas of sensation and reflection. For example; let us consider the complex idea signified by the word murder. First, from reflection, we have the ideas of willing, considering, purposing, malice, &c. all of life, perception, and self-motion. Secondly, from sensation, we have the ideas of man, and of some action whereby we put an end to that perception and motion in the man; All which simple ideas are comprehended in the word murder.

This collection of simple ideas being found to agree or disagree with the esteem of the country I have been bred in, and to be held worthy of praise or blame, I call the action virtuous or vicious. If I have the will of a supreme invisible Law maker for my rule; then as I suppose the action commanded or forbidden by God, I call it good or evil, fit or duty: If a compare it with the civil law of my country, I call it lawful or unlawful, a crime or no crime.

Moral actions may be considered two ways:
First, As they are in themselves a collection of simple ideas; in which sense, they are positive absolute ideas.
Secondly, As good or bad, or indifferent: In this respect they are relative, it being their conformity or disagreement with some rule that makes them so. We ought carefully to distinguish between the positive idea of the action, and the reference it has to a rule: Both which are commonly comprehended under one name, which often occasions confusion, and misleads the judgment.

Thus the taking from another what is his, without his consent, is properly called stealing: But that name being commonly understood to signify also the moral pravity of the action, men are apt to condemn whatever they hear called stealing as an ill action disagreeing with the rule of right. And yet the private taking away his sword from a madman, to prevent his doing mischief, though it be properly denominated stealing, as the name of such a mixed mode, yet when compared to the law of God, it is no sin or transgression, though the name stealing ordinarily carries such an intimation with it.

Of real and fantastical ideas.

Our ideas, in reference to things from whence they are taken, or which they may be supposed to represent, come under a threefold distinction; and are, first, either real or fantastical; secondly, adequate, or inadequate; thirdly, true or false.

Real ideas are such as have a foundation in nature, such as have a conformity with the real being and existence of things, or with their archetypes.

Fantastical are such as have no foundation in nature, nor any conformity with that reality of being to which they are referred as to their archetypes. By examining the several sorts of ideas we shall find, that, first, our simple ideas are all real; not that they are images or representations of what does exist, but as they are the certain effects of powers in things without us, ordained by our Maker to produce in us such sensations: They are real ideas in us, whereby we distinguish the qualities that are really in things themselves.

Their reality lies in the steady correspondence they have with the distinct constitutions of real beings. But whether they answer to those constitutions as to causes or patterns, it matters not; it suffices, that they are constantly produced by them.

Complex ideas being arbitrary combinations of simple ideas put together, and united under one general name, in forming of which the mind ues its liberty, we must inquire which of these are real, and which imaginary combinations.

First, Mixed modes and relations having no other reality than what they have in the minds of men, nothing else is required to make them real, but a possibility of existing conformable to them. These ideas being themselves archetypes, cannot differ from their archetypes, and so cannot be chimerical; unless any one will jumble together in them inconsistent ideas. Those indeed that have names assigned them in any language, must have a conformity to the ordinary signification of the name that is given.
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given them, that they may not be thought fantastical.

Secondly, Our complex ideas of substances being made, in reference to things existing without us, whose representations they are thought are no farther real, than as they are such combinations of simple ideas as are really united, and co-exist in things without us: those are fancifical which are made up of several ideas that never were found united, as Centaur, &c.

Of ideas adequate or inadequate.

Real ideas are either adequate or inadequate. First, adequate; which perfectly represent those archetypes which the mind supposes them taken from, and which it makes them to stand for. Secondly, Inadequate; which are such as do but partially or incompletely represent those archetypes to which they are referred. Whence it appears,

First, That all our simple ideas are adequate; for they being the effects of certain powers in things fitted and ordained by God to produce such sensations in us, they cannot but be correspondent and adequate to such powers, and we are sure they agree to the reality of things.

Secondly, Our complex ideas of modes being voluntary collections of simple ideas, which the mind puts together without reference to any real archetypes, cannot but be adequate ideas. They are referred to no other pattern, nor made by any original, but the good-loving and will of him that makes the combination. If indeed one would conform his ideas to those which are formed by another person, they may be wrong or inadequate, because they agree not to that to which the mind designs to be their archetype and pattern; in which respect only any ideas of modes can be wrong, imperfect, or inadequate.

Thirdly, Our ideas of substances have in the mind a double reference: First, They are sometimes referred to a supposed real essence, of each species of things; Secondly, They are designed for representations in the mind, of things that do exist, by ideas discoverable in them: In both which respects they are inadequate.

First, If the names of substances stand for things, as supposed to have certain real essences, whereby they are of this or that species, of which real essences men are wholly ignorant; it follows, that the ideas they have in their minds, being referred to real essences as archetypes which are unknown, they must be so far from being adequate, that they cannot be supposed to be any representation of them at all. Our complex ideas of substances are nothing but certain collections of simple ideas that have been observed or supposed constantly to exist together. But such a complex idea cannot be the real essence of any substance: For then the properties we discover in it would be deducible from it, and their necessity connection with it be known; as all the properties of a triangle depend on and are deducible from the complex idea of three lines including a space: But it is certain, that in our complex ideas of substances are not contained such ideas on which all other qualities that are to be found in them depend.

Secondly, Those that take their ideas of substances from their sensible qualities, cannot form adequate ideas of them: Because their qualities and powers are so various, that no man's complex idea can contain them all. Most of our simple ideas, whereas of complex ones of substances do consist, are powers, which being relations to other substances, we cannot be sure we know all the powers, till we have tried what changes they are fitted to give and receive from other substances in their several ways of application; which being not possible to be tried upon one body, much less upon all, it is impossible we should have adequate ideas of any substance made of a collection of all its properties.

Of true and false ideas.

Truth and falsehood, in propriety of speech, belong only to propositions; and when ideas are termed true or false, there is some secret or tacit proposition which is the foundation of that denomination. Our ideas being nothing but appearances, or perceptions in the mind, can, in strictness of speech, no more be said to be true or false, than single names of things can be said to be true or false. The idea of Centaur has no more falsehood in it when it appears in our minds, than the name Centaur when it is pronounced or written on paper. For truth or falsehood lying always in some affirmation or negation, our ideas are not capable, any of them, of being false, till the mind passes some judgment on them, that is, affirms or denies something of them. In a metaphysical sense, they may be said to be true, that is, to be really such as they exist; though in things called true, even in that sense, there is perhaps a secret reference to our ideas, looked upon as the standards of that truth; which amounts to a mental proposition.

When the mind refers any of its ideas to any thing extraneous to it, they are then capable of being true or false: because in such a reference, the mind makes a tacit supposition of their conformity to that thing; which supposition, as it is true or false, so the ideas themselves come to be denominated. This happens in these cases:

1d. When the mind supposes its idea conformable to that in other men's minds, called by the same name, such as that of justice, virtue, &c.

2d. When the mind supposes any idea conformable to some real existence. Thus, that of Man is true, that of Centaur false; the one having a conformity to what has really existed, the other not.

3d. When the mind refers any of its ideas to that real constitution and essence of any thing whereon all its properties depend: and thus the greatest part, if not all our ideas of substances are false.

As to the first, when we judge of our ideas by their conformity to those of other men, they may be any of them false; but simple ideas are least liable to be mistaken. We seldom mistake green for blue, or bitter for sweet; much less do we confound the names belonging to different senses, and call a colour by the name of a taze. Complex ideas are much more liable to falshood in this particular; and those of mixed modes more than substances: because in substances, their sensible qualities serve, for the most part, to distinguish them clearly; but in mixed modes we are more uncertain, and we may call that justice which ought to be called by another name. The reason
referred to the real existence of things, none can be termed false but our complex ideas of substances: for our simple ideas being nothing but perceptions in us answerable to certain powers in external objects, their truth consists in nothing but such appearances as are produced in us suitable to those powers: neither do they become liable to the imputation of falseness, whether we judge these ideas to be in the things themselves, or no: for God having set them as marks of distinguishing things, that we may be able to discern one thing from another, and thereby chuse them as we have occasion, it alters not the nature of our simple ideas, whether we think the idea of blue (for instance) to be in the violet itself, or in the mind only: and it is equally from that appearance to be denominated blue, whether it be that real colour, or only a peculiar texture in it, that causes us to call it blue: since the name blue notes properly nothing but that mark of distinction that is in a violet, discernible only by our eyes, whatever it consists in.

Neither would our simple ideas be false, if by the different structure of our organs it were so ordered, that the same object should produce in several mens minds different ideas: for this could never be known, since objects would operate constantly after the same manner. It is most probable, nevertheless, that the ideas produced by the same objects in different mens minds, are very near and indistinguishably like. Names of simple ideas may be misapplied: as a man, ignorant in the English tongue, may call purple, scarlet: but this makes no falsehood in the idea. Complex ideas of modes cannot be false, in reference to the essence of any thing really existing; because they have no reference to any pattern existing, or made by nature.

Our complex ideas of substances, being all referred to patterns in things themselves, may be false. They are so, if by way of representations of the unknown essences of things: 2dly, When they put together simple ideas which in the real existence of things have no union; as in centaur. 3dly, When from any collection of simple ideas, that do always exist together, there is separated, by a direct negation, any one simple idea which is constantly joined with them. Thus, if from extension, solidity, fixedness, malleableness, fusibility, &c. we remove the colour observed in gold: If this idea be only left out of the complex one of gold, it is to be looked on as an inadequate and imperfect, rather than a false one; since though it contains not all the simple ideas that are united in nature, yet it puts none together but what do really exist together.

Upon the whole, our ideas, as they are considered by the mind, either in reference to the proper significations of their names, or in reference to the reality of things, may more properly be called right or wrong ideas, according as they agree or disagree to those patterns to which they are referred. The ideas that are in mens minds, simply considered, cannot be wrong, unless complex ideas, wherein inconsistent parts are jumbled together. All other ideas are in themselves right, and the knowledge about them right and true knowledge. But when we come to refer them to any patterns, or archetypes, then they are capable of being wrong, as far as they disagree with such archetypes.

Of the association of ideas.

Some of our ideas have a natural correspondence and connection one with another: It is the office and excellency of our reason to trace these, and hold them together in that union and correspondence which is founded in their peculiar beings. Besides this, there is another connection of ideas wholly owing to chance or custom: Ideas that in themselves are not at all of kin, come to be so united in some mens minds, that it is very hard to separate them; they always keep company, and the one no sooner comes into the understanding, but its associate appears with it; and if they are more than two, the whole gang always inseparably shew themselves together. This strong combination of ideas, not allied by nature, the mind makes in itself either voluntarily, or by chance: And hence it comes in different mens minds to be very different, according to their different inclinations, education, interests, &c.

Custom fettes habits of thinking in the understanding, as well as of determining in the will, and of motions in the body; all which seem to be but trains of motion in the animal spirits, which, once set a going, continue on in the same steps they have been used to; which by oftentirely become easy, and, as it were, natural. As far as we can comprehend thinking, thus ideas seem to be produced in our minds; or if they are not, this may serve to explain their following one another in an habitual train, when once they are put into that tract, as well as it does to explain such motions of the body.

This connection in our minds of ideas, in themselves loose and independent one of another, is of so great force to fet us awry in our actions, as well moral as natural, passions, reasonings, and notions themselves, that perhaps there is not any one thing that deserves more to be looked after. Thus the ideas of goblins and spirits have really no more to do with darkness than light; yet let but a foolish child inculcate these often on the mind of a child, and raise them there together, possibly he shall never be able to separate them again so long as he lives, but darkness shall ever afterwards bring with it those frightful ideas. A man has suffered pain or sickness in any place; he saw his friend die in such a room; though these have in nature nothing to do one with another, yet when the idea of the place occurs to his mind, it brings that of the pain and displeasure with it; he confounds him in his mind, and can as little bear the one as the other.

Intellectual habits and defects this way contradicted, are not less frequent and powerful, though less observed. Let the ideas of being and matter be strongly joined either by education or much thought, whilst these are still combined in the mind, what notions, what reasonings will
there be about separate spirits? Let custom from the very
culhhood have joined figure and shape to the idea of God,
and what absurdities will that mind be liable to about
the Deity? Let the idea of infallibility be joined to any
person, and these two constantly together possefs the
mind; and then one body in two places at once shall be
swallowed for a certain truth, whenever that imagined in-
fallible person dilates, and demands assent without in-
quity.

Some such wrong combinations of ideas will be found to
establish the irreconcilable opposition between different
sects of philosophy and religion: for we cannot imagine
every one of their followers to impose wilfully on himself,
and what absurdities will that mind be liable to about
persons, and these two constantly together possess the
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sfallible person dilates, and demands assent without in-
quity.

2. The next fort of agreement or disagreement the
mind perceives in any of its ideas, may be called relative,
and is nothing but the perception of the relation between
any two ideas of what kind forever; that is, their agree-
ment or disagreement one with another in several ways
the mind takes of comparing them.

3. The third fort of agreement or disagreement to be
found in our ideas, is, coexistence or non-coexistence in
the fame subject; and this belongs particularly to substan-
ces. Thus when we pronounce concerning gold, that it
is fixed, it amounts to no more but this, that fixedness,
or a power to remain in the fire unconsumed, is an idea
that always accompanies that particular fort of yellowness,
weight, fusibility, &c. which make our complex idea
signified by the word gold.

4. The fourth fort, is that of actual and real exis-
tence agreeing to any idea. Within these four forts
of agreement or disagreement, is contained all the
knowledge we have, or are capable of. For all that we
know or can affirm concerning any idea, is, That it is, or
is not the fame with some other; as, that blue is not yel-
low; That it does, or does not coexist with another in
the fame subject; as, that iron is susceptible of magnet-
ical impressions; That it has that or this relation to fome
other ideas; as, That two triangles, upon equal bases be-
tween two parallels, are equal: or, that it has a real
existence without the mind; as, that God is.

There are several ways wherein the mind is possessed
of truth, each of which is called knowledge. First,
there is actual knowledge, when the mind has a present
view of the agreement or disagreement of any of its ideas,
or of the relation they have with another. Second-
ly, A man is said to know any proposition, when having
once evidently perceived the agreement or disagreement
of the ideas whereof it consists, and so lodged it in his
memory, that whenever it comes to be reflected on again,
the mind affents to it without doubt or hesitation, and is
certain of the truth of it. And this may be called habi-
tual knowledge. And thus a man may be said to know
all those truths which are lodged in his memory by a fore-
gone, clear, and full perception.

Of habitual knowledge there are two forts: the one
is of such truths laid up in the memory, as whenever they
occur to the mind, it actually perceives the relation that is
between those ideas. And this is in all those truths,
where the ideas themselves, by an immediate view, dis-
cover their agreement or disagreement one with another.
The other is of such truths, whereof the mind having
been convinced, it retains the memory of the conviction,
without the proofs. Thus a man that remembers cer-
tainly, that he once perceived the demonstration, that the
three angles of a triangle are equal to two right ones,
knows it to be true, when that demonstration is gone out

ideas to disagree. This it does without any pains or de-
duction, by its natural power of perception and dilution.
This is what men of art have reduced to those general
rules, viz. what is, is; and it is impossible for the same
thing to be and not to be. But no maxim can make a
man know it clearer, that round is not flat, than the
bare perception of those two ideas, which the mind at
first sight perceives to disagree.

Of knowledge in general.

Since the mind, in all its thoughts and reasonings, has
no other immediate object but its own ideas, which alone
does or can contemplate, it is evident that our know-
ledge is only converfant about them. Knowledge then
seems to be nothing but the perception of the connection
and agreement, or disagreement and repugnancy of any
of our ideas: where this perception is, there is know-
lledge; and where it is not, there, though we fancy,
guess, or believe, yet we always come short of know-
lledge. Where we know that white is not black, what do
we but perceive that these two ideas do not agree? Or
that the three angles of a triangle, are equal to two right
ones; what do we more but perceive that equality to two
right ones does necessarily agree to, and is inseparable
from the three angles of a triangle? But to understand
a little more distinctly wherein this agreement or disagree-
ment consists, we may reduce it all to these four forts:

1st. Identity or diversity; 2dly, Relation; 3dly, Co-
existence; 4thly, Real existence.

1. Identity or diversity. It is the first act of the
mind, to perceive its ideas; and so far as it perceives
them, to know each what it is, and thereby to perceive
their difference, that is, the one not to be the other:
by this the mind clearly perceives each idea to
agree with itself, and to be what it is; and all distinct

ideas to disagree. This it does without any pains or de-
duction, by its natural power of perception and dilution.
This is what men of art have reduced to those general
rules, viz. what is, is; and it is impossible for the same
thing to be and not to be. But no maxim can make a
man know it clearer, that round is not flat, than the
bare perception of those two ideas, which the mind at
first sight perceives to disagree.
of his mind, and possibly cannot be recollected: But he
knows it in a different way from what he did before,
namely, not by the intervention of those intermediate
ideas, whereby the agreement or disagreement of those in
the proposition was at first perceived, but by remembering,
<i.e.</i> knowing that he was once certain of the truth of
this proposition, that the three angles of a triangle are
equal to two right ones. The immutability of the same
relations between the same immutable things, is now the
idea that shews him, that if the three angles of a triangle
were once equal to two right ones, they will always be
do. And hence he comes to be certain, that what was
once true, is always true; what ideas once agreed, will
always agree; and consequently, what he once knew to
be true, he will always know to be true, as long as he
can remember that he once knew it.

Of the degrees of our knowledge.

All our knowledge consisting in the view the mind has
of its own ideas, which is the utmost light and greatest
certainty we are capable of, the different clearness of our
knowledge seems to lie in the different way of perception
the mind has of the agreement or disagreement of any of
its ideas.

When the mind perceives this agreement or disagree-
ment of two ideas immediately by themselves, without
the intervention of any other, we may call it intuitive
knowledge; in which cases the mind perceives truth,
as the eye does light, only by being directed towards it.
Thus the mind perceives, that white is not black; that three
are more than two; and equal to one and two. This part
of knowledge is irreducible, and, like the bright fun-shine,
forces itself immediately to be perceived as soon as ever
the mind turns its view that way. It is on this intuition
that depends all the certainty and evidence of our other
knowledge; which certainty every one finds to be so
great, that he cannot imagine, and therefore not require
a greater.

The next degree of knowledge, is, where the mind
perceives not this agreement or disagreement immediate-
ly, or by the <i>juxta-position</i>, as it were, of the ideas, be-
cause those ideas concerning whose agreement or disagree-
ment the inquiry is made, cannot by the mind be so put
together, as to shew it. In this case the mind is fond to
discover the agreement or disagreement which it searches,
by the intervention of other ideas: And this is that which
we call reasoning. And thus, if we would know the agree-
ment or disagreement in bigness, between the three
angles of a triangle, and two right angles, we cannot by
an immediate view and comparing them do it; because
the three angles of a triangle cannot be brought at once,
and be compared with any other one or two angles. And
so of this the mind has no immediate or intuitive know-
ledge. But we must find out some other angles, to which
the three angles of a triangle have equality; and finding
those equal to two right ones, we come to know the equality
of these three angles to two right ones. Those intervening
ideas which serve to shew the agreement of any two others,
are called proofs; and where the agreement or disagree-
ment is by this means plainly and clearly perceived, it is
called demonstration. A quickness in the mind to find
those proofs, and to apply them right, is that which is
called sagacity.

This knowledge, though it be certain, is not so clear
and evident as intuitive knowledge. It requires pains
and attention, andsteady application of mind, to discover
the agreement or disagreement of the ideas it considers;
and there must be a progression by steps and degrees,
before the mind can in this way arrive at certainty. Before
demonstration there was a doubt, which, in intuitive
knowledge, cannot happen to the mind that has its facul-	y of perception left to a degree capable of distinct ideas,
no more than it can be a doubt to the eye (that can dif-
tinctly see white and black) whether this ink and paper
be all of a colour.

Now, in every step that reason makes in demonstrative
knowledge, there is an intuitive knowledge of that agree-
ment or disagreement it seeks with the next intermediate
idea, which it uses as a proof; for if it were not so, that
yet would need a proof; since without the perception of
such agreement or disagreement, there is no knowledge
produced. By which it is evident, that every step in rea-
soning, that produces knowledge, has intuitive certainty:
which when the mind perceives, there is no more requi-
red but to remember it, to make the agreement or disa-
greement of the ideas concerning which we inquire visible
and certain. This intuitive perception of the agreement
or disagreement of the intermediate ideas in each step and
progression of the demonstration, must also be exactly
carried in the mind; and a man must be sure that no part
is left out; which because in long deductions the mem-
ory cannot easily retain, this knowledge becomes more
imperfect than intuitive, and men often embrace falfes-
hoods for demonstrations.

It has been generally taken for granted, that mathema-
tics alone are capable of demonstrative certainty. But
to have such an agreement or disagreement as may be in-
tuitively perceived, being not the privilege of the ideas of
number, extension, and figure alone, it may possibly be
the want of due method and application in us, and not of
sufficient evidence in things, that demonstration has been
thought to have so little to do in other parts of knowledge:
For in whatever ideas the mind can perceive the agree-
ment or disagreement immediately, there it is capable of
intuitive knowledge: And where it can perceive the agree-
ment or disagreement of any two ideas, by an intuitive
perception of the agreement or disagreement they
have with any intermediate ideas, there the mind is capa-
bile of demonstration which is not limited to the ideas of
figure, number, extension, or their modes. The rea-
son why it has been generally supposed to belong to them
only, is, because in comparing their equality or excess the
modes of numbers have every the least difference very
clear and perceivable: And in extension, though every
the least excess is not so perceptible, yet the mind has
found out ways to discover the just equality of two angles,
extensions, or figures: and both, that is, numbers and
figures, can be set down by visible and lasting marks.

But in other simple ideas, whose modes and differences
are made and counted by degrees, and not quantity, we
have not so nice and accurate a distinction of their differ-
ences, as to perceive or find ways to measure their just
equality,
equality, or the least differences: For tho"se other simple ideas being appearances or sensations produced in us by the size, figure, motion, &c. of minute corporscles singly inelensible, their different degrees also depend on the variation of some, or all of those causes; which since it cannot be observed by us in particles of matter, whereof each is too subtle to be perceived, it is impossible for us to have any exact measures of the different degrees of those simple ideas. Thus, for instance, not knowing what number of particles, nor what motion of them, is fit to produce a precise degree of whiteness, we cannot demonstrate the certain equality of any two degrees of whiteness, because we have no certain standard to measure them by, nor means to distinguish every the least difference; the only help we have been from our senses, which in this point fail us.

But where the difference is so great as to produce in the mind ideas clearly distinct, there ideas of colours, as we see in different kinds, blue and red, (for instance,) are as capable of demonstration as ideas of number and extension. What is here said of colours, holds true in all secondary qualities. These two then, intuition and demonstration, are the degrees of our knowledge; whatever comes short of one of these, is but faith or opinion, not knowledge, at least, in all general truths. There is, indeed, another perception of the mind employed about the particular existence of finite beings without us; which going beyond probability, but not reaching to either of the foregoing degrees of certainty, passes under the name of knowledge.

Nothing can be more certain, than that the idea we receive from an external object is in our minds: This is intuitive knowledge; but whether we can thence certainly infer the existence of anything without us, corresponding to that idea, is that whereof some men think there may be a question made, because men may have such an idea in their minds, when no such things exist, no such object affects their senses. But its evident that we are invincibly conscious to ourselves of a different perception, when we look upon the sun in the day, and think on it by night; when we actually taste wormwood, or smell a rose, or only think on that flavour or odour. So that we may add to the two former sorts of knowledge, this also of the existence of particular external objects, by that perception and consciousness we have of the actual entrance of ideas from them, and allow these three degrees of knowledge, viz. intuitive, demonstrative, and sensitive.

But since our knowledge is founded on, and employed about our ideas only, will it follow thence that it must be conformable to our ideas; and that where our ideas are clear and distinct, obscure and confused, there our knowledge will be so too? No. For our knowledge consisting in the perception of the agreement or disagreement of any two ideas, its clearness or obscurity consists in the clearness or obscurity of that perception, and not in the clearness or obscurity of the ideas themselves. A man (for instance) that has a clear idea of the angles of a triangle, and of equality to two right ones, may yet have but an obscure perception of their agreement; and so have but a very obscure knowledge of it. But obscure and confused ideas can never produce any clear or distinct knowledge; because, as far as any ideas are obscure or confused, so far the mind can never perceive clearly whether they agree or disagree.

Of the extent of human knowledge.

From what has been said concerning knowledge, it follows, First, That we can have no knowledge farther than we have ideas.

Secondly, That we have no knowledge farther than we can have perception of that agreement or disagreement of our ideas, either by intuition, demonstration, or sensation.

Thirdly, We cannot have an intuitive knowledge that shall extend itself to our ideas, and all that we would know about them, because we cannot examine and perceive all the relations they have one to another, by juxtaposition, or an immediate comparison one with another. Thus we cannot intuitively perceive the equality of two extentions, the difference of whole figures makes their parts incapable of an exact immediate application.

Fourthly, Our rational knowledge cannot reach to the whole extent of our ideas; because between two different ideas we would examine, we cannot always find such proofs as we can connect one to another, with an intuitive knowledge in all the parts of the deduction.

Fifthly, Sensitive knowledge reaching no farther than the existence of things actually present to our senses, is yet much narrower than either of the former.

Sixthly, From all which it is evident, that the extent of our knowledge, comes not only short of the reality of things, but even of the extent of our own ideas. We have the ideas of a square, a circle, and equality; and yet, perhaps, shall never be able to find a circle equal to a square.

The affirmations or negations we make concerning the ideas we have, being reduced to the four sorts above mentioned, viz. identity, coexistence, relation, and real existence, we shall examine how far our knowledge extends in each of these.

First, As to identity and diversity, our intuitive knowledge is as far extended as our ideas themselves; and there can be no idea in the mind, which it does not presently, by an intuitive knowledge, perceived to be what it is, and to be different from any other.

Secondly, As to the agreement or disagreement of our ideas in coexistence: In this our knowledge is very short; though in this consists the greatest and most material part of our knowledge, concerning substances. For our ideas of substances being nothing but certain collections of simple ideas, coexisting in one subject, (our idea of flame, for instance, is a body hot, luminous, and moving upward;) when we would know any thing farther concerning this, or any other sort of substance, what do we but inquire what other qualities or powers these substances have, or have not? Which is nothing else but to know what other simple ideas do or do not coexist with those that make up that complex idea. The reason of this, is because the simple ideas which make up our complex ideas of substances, have no visible necessary con-
metaphysics.

The ideas of a Supreme Being, infinite in power, goodness, and wisdom, whose workmanship we are, and on whom we depend; and the idea of ourselves, as understanding rational creatures; would, if duly considered, afford such foundations of our duty, and rules of action, as might place morality among the sciences capable of demonstration. The relations of other modes may certainly be perceived, as well as those of number and extension. Where there is no property, there is no injustice, is a proposition as certain as any demonstration in Euclid: for the idea of property being a right to any thing; and the idea of injustice being the violation of that right; it is evident, that these ideas being thus established, and these names annexed to them, we can as certainly know this proposition to be true, as that a triangle has three angles equal to two right ones. Again, No government allows absolute liberty. The idea of government being the establishment of society upon certain rules or laws which require conformity to them, and the idea of absolute liberty being for any one to do whatever he pleases, we are as capable of being certain of the truth of this proposition, as of any in mathematics.

What has given the advantage to the ideas of quality, and made them thought more capable of certainty and demonstration, is,

First, That they can be represented by sensible marks which have a nearer correspondence with them than any words or sounds. Diagrams drawn on paper are copies of the ideas, and not liable to the uncertainty that words carry in their signification: But we have no sensible marks that resembie our moral ideas; and nothing but words to express them by; which though when written they remain the same, yet the ideas they stand for may change in the same man; and it is very seldom that they are not different in different persons.

Secondly, Moral ideas are commonly more complex than figures. Whence these two inconveniences follow:

First, That their names are of more uncertain signification; the precise collection of simple ideas they stand for not being so easily agreed on, and so the sign that is used for them in communication always, and in thinking often, does not readily carry with it the same idea. Secondly, The mind cannot easily retain those precise combinations so exactly and perfectly as is necessary; in the examination of the habits and correspondencies, agreements or disagreements of several of them one with another, especially where it is to be judged off by long deductions, and the intervention of several other complex ideas, to shew the agreement or disagreement of two remote ones.

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Now one part of these disadvantages in moral ideas, which has made them be thought not capable of demonstration, may in a good measure be remedied by definitions, setting down that collection of simple ideas which every term shall stand for, and then using the terms declaratively and constantly for that precise collection.

As to the fourth sort of knowledge, viz. of the real actual existence of things, we have an intuitive knowledge of our own existence; a demonstrative knowledge of the existence of God; and a sensitive knowledge of the objects that present themselves to our sensae.

From what has been said, we may discover the causes of our ignorance: which are chiefly these three: First, Want of ideas; Secondly, Want of a discoverable connection between the ideas we have; Thirdly, Want of tracing and examining our ideas.

First, There are some things we are ignorant of for want of ideas. All the simple ideas we have are confined to the observances of our senses, and the operations of our own minds that we are conscious of in ourselves. What other ideas it is possible other creatures may have, by the assistance of other senses and faculties more or perfecter than we have, or different from ours, it is not for us to determine; but to lay or think there are no such, because we conceive nothing of them, is no better an argument, than if a blind man should be positive in it, that there was no such thing as light and colours, because we know not. This we know, and certainly find, that we have no other views of them, besides those we have, to make discoveries of them more perfect. The intellectual and sensible world are in this perfectly alike, that the parts which we see of either of them, hold no proportion with that we see not; and whatsoever we can reach with our eyes or our thoughts of either of them, is but a point almost in comparison of the real.

Another great cause of ignorance, is the want of ideas that we are capable of. This keeps us in ignorance of things we conceive capable of being known. Bulk, figure, and motion we have ideas of; yet not knowing what is the particular bulk, motion, and figure of the greatest part of the bodies of the universe, we are ignorant of the several powers, efficacies, and ways of operation, whereby the effects we daily see are produced. These are hid from us in some things, by being too remote; in others, by being too minute.

When we consider the vast distance of the known and visible parts of the world, and the reasons we have to think that what lies within our ken is but a small part of the immense universe, we shall then discover an huge abyss of ignorance. What are the particular fabricks of the great masses of matter, which make up the whole suspension of corporeal beings; how far they are extended; and what is their motion, and how continued; and what influence they have upon one another; are contemplations, that at first glimpse our thoughts lose themselves in. If we confine our thoughts to this little system of our fun, and the greater masses of matter that visibly move about it; what several sorts of vegetable, animals, and intellectual corporeal beings, infinitely different from those of our little spot of earth, may probably be in other planets, to the knowledge of which, even of their outward figures and parts, we can no way attain, whilst we are confined to this earth, there being no natural means, either by sensation or reflection, to convey their certain ideas into our minds?

There are other bodies in the universe, no less concealed from us by their minuteness. These inensible corpulces being the active parts of matter, and the great instruments of nature on which depend all their secondary qualities and operations, our want of precise distinct ideas of their primary qualities keeps us in incurable ignorance of what we desire to know about them. Did we know the mechanical affections of rhubarb and opium, we might as easily account for their operations of purging or causing sleep, as a watchmaker can for the motions of his watch. The dissolving of silver in aqua regia, or gold in aqua regia, and not vice versa, would be then, perhaps, no more difficult to know, than it is to a smith to understand why the turning of one key will open a lock, and not the turning of another. But whilst we are destitute of fufceptible acute enough to discover the minute particles of bodies, and to give us ideas of their mechanical affections, we must be content to be ignorant of their properties and operations: Nor can we be assured about them any farther than some few trials we make are able to reach; but whether they will succeed another time, we cannot be certain. This hinders our certain knowledge of universal truths concerning natural bodies; and our reason carries us herein very little beyond particular matters of fact. And therefore, how far forever human industry may advance useful and experimental philosophy, in physical things, yet scientific will still be out of our reach; because we want perfect and adequate ideas of those very bodies which are nearest to us, and most under our command.

This, at first sight, shews us how disproportionate our knowledge is to the whole extent, even of material beings; to which if we add the consideration of that infinite number of spirits that may be, and probably are, which are yet more remote from our knowledge, whereof we have no cognizance; we shall find this cause of ignorance conceal from us, in an impenetrable obscurity, almost the whole intellectual world, a greater certainly, and a more beautiful world than the material: For being some very few ideas of spirit we get from our own mind by reflection, and from thence the belt we can collect of the Father of all spirits, the Author of them and us and all things, we have no certain information so much as of the existence of other spirits but by revelation; much less have we distinct ideas of their different natures, states, powers, and several constitutions, wherein they agree or differ from one another, and from us: And therefore in what concerns their different species and properties, we are under an absolute ignorance.

The second cause of ignorance, is the want of discoverable connection between those ideas we have: Where we want that, we are utterly incapable of universal and certain knowledge: and are, as in the former case, left only to observation and experiment. Thus the mechanical
...al affections of bodies having no affinity at all with the ideas they produce in us, we can have no distinct knowledge of such operations beyond our experience; and can reason no otherwise about them, than as the effects or, appearance of an infinitely wise agent, which perfectly surpasses our comprehensions.

The operation of our minds upon our bodies, is as inconceivable. How any thought should produce a motion in body, is as remote from the nature of our ideas, as how any body should produce any thought in the mind. That it is so, if experience did not convince us, the consideration of the things themselves would never be able in the least to discover to us.

In some of our ideas there are certain relations, habits, and connections, so visibly included in the nature of the ideas themselves, that we cannot conceive them separable from them by any power whatsoever: In these only we are capable of certain and universal knowledge. Thus the idea of a right lined triangle, necessarily carries with it an equality of its angles to two right ones. But the coherence and continuity of the parts of matter, the production of sensation in us of colours and sounds, &c. by impulse and motion, being such wherein we can discover no natural connection with any ideas we have, we cannot but ascribe them to the arbitrary will and good pleasure of the wise Architect.

The things that we observe constantly to proceed regularly, we may conclude to be by a law set them; but yet by a law that we know not; whereby, though causes work feability, and effects coherently flow from them, yet their connections and dependencies being not discoverable in our ideas, we can have but an experimental knowledge of them.

The third cause of ignorance, is our want of tracing those ideas we have or may have, and finding out those intermediate ideas which may shew us what habitude of agreement or disaffreement they may have one with another: And thus many are ignorant of mathematical truths, for want of application in inquiring, examining, and by due ways comparing those ideas.

Hitherto we have examined the extent of our knowledge, in respect of the several forts of beings that are: There is another extent of it, in respect of univerfality, which will also deserve to be considered; and in this regard our knowledge follows the nature of our ideas. If the ideas are abstract, whose agreement or disaffreement we perceive, our knowledge is universal. For what is known of such general ideas, will be true of every particular thing in which that essence, that is, abstract idea, is to be found: And what is once known of such ideas, will be perpetually, and for ever true. So that, as to all general knowledge, we must search and find it only in our own minds: And it is only the examining of our own ideas that furnishes us with that. Truths belonging to essences of things, (that is, to abstract ideas), are external, and are to be found out by the contemplation only of those essences, as the existence of things is to be known only from experience.

Of the reality of our knowledge.

This reader by this time may be ready to object, If it be true, that all knowledge lies only in the perception of the agreement or disaffreement of our own ideas, the visions of an enthusiast, and the reasonings of a fool-man, will be equally certain: It is no matter how things are, so a man observe but the agreement of his own imaginations, and talk conformably; it is all truth, all certainty.

To this it is answered, that if our knowledge of our ideas should terminate in them, and reach no farther, where there is something farther intended, our most fee-rious thoughts would be of little more use than the reveries of a crazy brain. But it is evident, that this way of certainty, by the knowledge of our own ideas, goes a little farther than bare imagination: and that all the certainty of general truths is a manias, lies in nothing else but this knowledge of our ideas.

It is evident, that the mind knows not things immediately, but by the intervention of the ideas it has of them. Our knowledge therefore is real, only so far as there is a conformity between our ideas and the reality of things. But how shall we know when our ideas agree with things themselves? There are two sorts of ideas, that we may be assured agree with things: These are,

First, Simple ideas; which since the mind can by no means make to itself, must be the effect of things occurring upon the mind in a natural way, and producing therein those perceptions, which, by the will of our Maker, they are ordained and adapted to. Hence it follows, that simple ideas are not fictions of our fancies, but the natural and regular productions of things without us, really operating upon us; which carry with them all the conformity our finite requires, which is to represent things under those appearances they are fitted to produce in us. Thus the idea of whiteness, as it is in the mind, exactly answers that power which is in any body to produce it there. And this conformity between our simple ideas, and the existence of things, is sufficient for real knowledge.

Secondly, All our complex ideas, except those of substances, being archetypes of the mind's own making, and not referred to the existence of things as to their originals, cannot want any conformity necessary to real knowledge: For that which is not designed to represent any thing but itself, can never be capable of a wrong representation. Here the ideas themselves are considered as archetypes, and things no otherwise regarded than as they are conformable to them. Thus the mathematician considers the truth and properties belonging to a rectangle, or circle, only as they are ideas in his own mind, which possibly he never found existing mathematically, that is, precisely true; yet his knowledge is not only certain, but real; because real things are no farther concerned, nor intended to be meant by any fuch propositions, than as things really agree to those archetypes in his mind. It is true of the idea of a triangle, that its three angles are equal to two right ones: It is true also of a triangle, wherever it exists: What is true of those figures, that have barely an ideal existence in his mind, will hold true of them also when they come to have a real existence in matter.

Hence it follows, that moral knowledge is as capable of real certainty as mathematics: For certainty being nothing
nothing but the perception of the agreement or disagreement of our ideas, and demonstration nothing but the perception of such agreement by the intervention of other ideas, our moral ideas, as well as mathematical, being archetypes themselves, and so adequate or complete ideas, all the agreement or disagreement we shall find in them will produce real knowledge, as well as in mathematical figures. That which is requisite to make our knowledge certain, is the clearness of our ideas; and that which is required to make it real, is, that they answer their archetypes.

Thirdly, But the complex ideas, which we refer to archetypes without us, may differ from them, and so our knowledge about them may come short of being real; and such are our ideas of substances. These must be taken from something that does or has existed, and not be made up of anything that does or has existed, and not be made up of such ample ones as have been discovered to coexist in nature. And our ideas being thus true, their agreement we find they have with others will be knowledge. Whatever ideas we have, we have, the agreement we find they have with others will be knowledge. If those ideas be abstract, it will be general knowledge. But to make it real concerning substances, the ideas must be taken from the real existence of things. Wherever, therefore, we perceive the existence or disagreement of our ideas, there is certain knowledge: And wherever we are sure those ideas agree with the reality of things, there is certain real knowledge.

Of truth in general.

Truth, in the proper import of the word, signifies the joining or separating of signs, as the things signified by them do agree or disagree one with another. The joining or separating of signs, is what we call propositions: So that truth properly belongs only to propositions. Whereof there are two sorts, mental and verbal; as there are two sorts of signs commonly made use of, ideas and words.

It is difficult to treat of mental propositions without verbal; because, in speaking of mental, we must make use of words, and then they become verbal. Again, men commonly in their thoughts and reasonings use words instead of ideas; especially if the subject of their meditation contains in it complex ideas. If we have occasion to form mental propositions about white, black, circle, &c. we can, and often do, frame in our minds the ideas themselves, without reflecting on the names: But when we would consider, or make propositions about the more complex ideas, as of a man, vitriol, fortitude, glory, &c. we usually put the name for the idea; because the idea of these names stand for being for the most part confused, imperfect, and undetermined, we reflect on the names themselves, as being more clear, certain, and distinct, and reader to occur to our thoughts, than pure ideas; and so we make use of these words instead of the ideas themselves, even when we would meditate and reason within ourselves, and make tacit mental propositions.

We must then observe two sorts of propositions that we are capable of making: First, Mental propositions, wherein the ideas in our understandings are put together or separated by the mind perceiving or judging of their agreement or disagreement. Secondly, Verbal propositions; which are words put together or separated in affirmative or negative sentences: So that proposition consists in joining or separating signs; and truth consists in putting together or separating those signs, according as the things they stand for agree or disagree.

Truth, as well as knowledge, may well come under the distinction of verbal and real; that being only verbal truth, wherein terms are joined according to the agreement or disagreement of the ideas they stand for, without regarding whether our ideas are such as really have or are capable of having an existence in nature. But then it is they contain real truth, when these signs are joined as our ideas agree, and when our ideas are such as, we know, are capable of having an existence in nature; which in substances we cannot know, but by knowing that such have existed. Truth is the marking down in words the agreement or disagreement of ideas as it is: Falsity is the marking down in words the agreement or disagreement of ideas otherwise than it is; and so for as these ideas, thus marked by sounds, agree to their archetypes, so far only is the truth real. The knowledge of this truth consists in knowing what ideas the words stand for, and the perception of the agreement or disagreement of those ideas, according as it is marked by those words.

Besides truth taken in the strict sense before mentioned, there are other sorts of truths: As, first, Moral truth; which is speaking things according to the persuasion of our own minds. Secondly, Metaphysical truth; which is nothing but the real existence of things conformable to the ideas to which we have annexed their names.

These considerations of truth either having been before taken notice of, or not being much to our present purpose, it may suffice here only to have mentioned them.

Of our knowledge of existence.

Hitherto we have only considered the essence of things; which being only abstract ideas, and thereby removed in our thoughts from particular existence, give us no knowledge of existence at all. We proceed now to inquire concerning our knowledge of the existence of things, and how we come by it.

We have the knowledge of our own existence by intuition; of the existence of God, by demonstration; and of other things, by sensation. As for our own existence, we perceive it so plainly, that it neither needs, nor is capable of any proof. I think, I reason, I feel pleasure and pain: can any of these be more evident to me than my own existence? If I doubt of all other things, that very doubt makes me perceive my own existence, and will not suffer me to doubt of that. If I know I doubt, I have as certain a perception of the thing doubting, as of that thought which I call doubt. Experience then convinces us, that we have an intuitive knowledge of our own existence; and an internal infallible perception that we are. In every act of sensation, reasoning, or thinking, we are conscious to ourselves of our own being; and
and in this matter come not short of the highest degree of certainty.

Of our knowledge of the existence of a God.

Though God has given us no innate ideas of himself, yet having furnished us with those faculties our minds are endowed with, he hath not left himself without a witness, since we have sense, perception, and reason, and cannot want a clear proof of him as long as we carry ourselves about us. Nor can we justly complain of our ignorance in this great point, since he has so plentifully provided us with means to discover and know him, so far as is necessary to the end of our being, and the great concernment of our happiness. But though this be the most obvious truth that reason discovers, yet it requires thought and attention; and the mind must apply itself to a regular deduction of it, from some part of our intuitive knowledge; or else we shall be as ignorant of this, as of other propositions which are in themselves capable of clear demonstration. To shew, therefore, that we are capable of knowing, that is, being certain, that there is a God, and how we may come by this certainty, we need go no farther than ourselves, and that undoubted knowledge we have of our own existence. It is beyond question, that man has a clear perception of his own being: He knows certainly that he exists, and that he is something. In the next place, man knows by an intuitive certainty, that bare nothing can no more produce any real being, than it can be equal to two right angles. If therefore, we know there is some real being, it is an evident demonstration, that from eternity there has been something; since what was not from eternity had a beginning; and what had a beginning, must be produced by something else. Next, it is evident, that, what has its being from another, must also have all that which is in and belongs to its being from another too: All the powers it has, must be owing to, and received from the same source. This eternal source then of all being must be also the source and original of all power; and so this eternal Being must be also the most powerful.

Again, man finds in himself perception and knowledge: We are certain, then, that there is not only some being, but some knowing intelligent being in the world. There was a time, then, when there was no knowing being, or else there has been a knowing being from eternity. If it be said, there was a time when that eternal being had no knowledge; the reply is, that then it is impossible there should have ever been any knowledge; it being as impossible that things wholly void of knowledge, and operating blindly, and without any perception, should produce a knowing being, as it is that a triangle should make itself three angles bigger than two right ones.

Thus from the consideration of ourselves, and what we infallibly find in our own constitutions, our reason leads us to the knowledge of this certain and evident truth, that there is an eternal, most powerful, and knowing being; and from this idea duly considered, will easily be deduced all those other attributes we ought to ascribe to this eternal being.

From what has been said, it is plain, we have a more certain knowledge of the existence of a God, than of any

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mind does sufficiently lead us into the knowledge of God. For it will hence follow, that all other knowing beings that have a beginning must depend on him, and have no other ways of knowledge or extent of power than what he gives them; and therefore if he made those, he made also the less excellent pieces of this universal, all insensible bodies, whereby his omniscience, power, and providence, will be established; and from thence all his other attributes necessarily follow.

Of our knowledge of the existence of other things.

The knowledge of our own being we have by intuition: The existence of a God, reason clearly makes known to us. The knowledge of the existence of any other thing, we can have only by sensation; for there being no necessary connection of real existence with any idea a man hath in his memory, nor of any other existence, but that of God, with the existence of any particular man; no particular man can know the existence of any other being, but only when, by actually operating upon him, it makes itself be perceived by him. The having the idea of any thing in our mind, no more proves the existence of that thing, than the picture of a man evidences his being in the world, or the visions of a dream make thereby a true history. It is therefore the actual receiving of ideas from without, that gives us notice of the existence of other things, and makes us know that something doth exist at that time without us, which caueth that idea in us, though perhaps we neither know nor consider how it doeth; for it takes not from the certainty of our history. It is therefore the actual receiving of ideas from without, that gives us notice of the existence of other things or our knowledge of any thing, let him consider that the certainty of things existing in rerum natura, when we have the testimony of our senses for it, is not only as great as our frame can attain to, but as our condition needs. For our faculties being not suited to the full extent of being, nor a clear comprehensive knowledge of all things, but to the preservation of us in whom they are, and accommodated to the use of life; they serve our purpose well enough, if they will but give us certain notice of those things that are convenient or inconvenient to us: For he that sees a candle burning, and has experimented the force of the flame, by putting his finger in it, will little doubt that this is something existing without him which does him harm, and puts him to pain; which is assurance enough; when no man requires greater certainty to govern his actions by, than what is as certain as his actions themselves: So that this evidence is as great as we can desire, being as certain to us as our pleasure or pain, that is, happiness or misery; beyond which we have no concernment either of knowing or being.

In fine, when our senses doth actually convey into our understandings any idea, we are assured that there is something at that time really existing without us. But this knowledge extends only as far as the present testimony of our senses, employed about particular objects, that do then affect them, and no farther. My seeing a man a minute since, is no certain argument of his present existence.

As when our senses are actually employed about any object, we know that it does exist: so by our memory we may be assured, that heretofore things that affected our senses have existed: And thus we have the knowledge of the past existence of several things, whereas our senses having informed us, our memories still retain the ideas; and of this we are past all doubt, so long as we remember well.

As to the existence of spirits, our having ideas of them does not make us know that any such things do exist without
without us, or that there are any finite spirits, or any other spiritual beings but the eternal God. We have ground from revelation, and several other reasons, to believe with assurance, that there are such creatures: But our senses not being able to discover them, we want the means of knowing their particular existence; for we can no more know that there are such spirits really existing, by the ideas we have of such beings, than by the ideas any one has of fairies, or centaurs, he can come to know, that things answering those ideas do really exist.

Hence we may gather, that there are two sorts of propositions: One concerning the existence of any thing answerable to such an idea, as that of an elephant, phœnix, motion, or angel, viz. whether such a thing does anywhere exist: And this knowledge is only of particulars, and not to be had of any thing without us, but only of God, any other way than by our senses.

Another sort of proposition is, wherein is expressed the agreement or disagreement of our abstract ideas, and their dependance one on another. And these may be universal and certain: so having the idea of God and my self, of fear and obedience, I cannot but be sure that God is to be feared and obeyed by me: and this proposition will be certain concerning man in general, if I have made an abstract idea of such a species, whereof I am one particular. But such a proposition, how certain soever, proves not to me the existence of men in the world; but will be true of all such creatures, whenever they do exist: which certainty of such general propositions, depends on the agreement or disagreement discernible in those abstract ideas. In the former case, our knowledge is the consequence of the existence of things producing ideas in our minds by our senses: in the latter, the consequences of the ideas that are in our minds, and producing those general propositions, many whereof are called eternal veritates: and all of them indeed are so; not from being written all or any of them in the minds of all men, or that they were any of them propositions in any one's mind, till he, having got the abstract ideas, joined or separated them by affirmation or negation; but wherever we can suppose such a creature as man is, endowed with such faculties, and thereby furnished with such ideas as we have, we must conclude he must needs, when he applies his thoughts to the consideration of his ideas, know the truth of certain propositions, many whereof are called eternal veritates.

Of judgment.

The understanding faculties being given to man, not barely for speculation, but also for the conduct of his life, a man would be at a great loss, if he had nothing to direct him but what has the certainty of true knowledge. He that will not eat till he has demonstration that it will nourish him, nor stir till he is infallibly assured of success in his business, will have little else to do but sit still, and perish.

Therefore as God hath sent some things in broad daylight; as he has given us some certain knowledge, though limited to a few things, in comparison, (probably as a taste of what intellectual creatures are capable of, to excite us a desire and endeavour after a better state;) so in the greatest part of our concernment, he has afforded us only the twilight of probability, suitable to that state of mediocrity and probationship he has been pleased to place us in here.

The faculty which God has given man to enlighten him, next to certain knowledge, is judgment; whereby the mind takes its ideas to agree or disagree, without perceiving a demonstrative evidence in the proofs. The mind exercises this judgment sometimes out of necessity, where demonstrative proofs and certain knowledge are not to be had; and sometimes out of listening, unskilfulness, or haste, even where they are to be had.

This faculty of the mind, when it is exercised immediately about things, is called judgment; when about truths delivered in words, is most commonly called assent or dissent. Thus the mind has two faculties convergent about truth and falsehood: First, Knowledge; whereby it certainly perceives, and is undoubtedly satisfied of the agreement or disagreement of any ideas. Secondly, Judgment, which is the putting ideas together, or separating them from one another in the mind, when their certain agreement or disagreement is not perceived, but presumed to be so. And if it fo unites or separates them as in reality things are, it is right judgment.

Of probability.

Probability is nothing but the appearance of the agreement or disagreement of two ideas, by the intervention of proofs, whose connection is not constant and immutable; or is not perceived to be so; but is or appears for the most part to be so; and is enough to induce the mind to judge the proposition to be true or false, rather than the contrary.

Of probability there are degrees, from the neighbourhood of certainty and demonstration, quite down to improbability and unlikelihood, even to the confines of impossibility: And also degrees of assent from certain knowledge, and what is next it, full assurance and confidence, quite down to conjecture, doubt, distrust, and disbelief. That proposition then is probable, for which there are arguments or proofs to make it pass or be received for true: The entertainment the mind gives to this sort of propositions, is called belief, assent, or opinion. Probability then being to supply the defect of our knowledge, is always conversant about propositions whereof we have no certainty, but only some inducements to receive them for true. The grounds of it are, in short, these two following.

First, The conformity of any thing with our own knowledge, experience, or observation.

Secondly, The testimony of others, vouching their observation and experience. In the testimony of others is
to be considered, *First*, The number; *Secondly*, The integrity; *Thirdly*, The skill of the witneses; *Fourthly*, The design of the author, if it be a testimony cited out of a book; *Fifthly*, The consistence of the parts and circumstances of the relation; *Sixthly*, Contrary testimonies.

The mind, before it rationally affents or disaffents to any probable proposition, ought to examine all the grounds of probability, and see how they make, more or less, for or against it; and upon a due balancing of the whole, reject or receive it, with a more or less firm assent, according to the preponderancy of the greater grounds of probability on one side, or the other.

**Of the degrees of assent.**

The grounds of probability, laid down in the foregoing section, as they are the foundations on which our assent is built, so are they also the measure whereby its several degrees are (or ought to be) regulated. Only we are to take notice, that no grounds of probability operate any farther on the mind, which searches after truth, and endeavours to judge right, than they appear, at least, in the first judgment or search that the mind makes. It is indeed in many cases impossible, and in most very hard, even for those who have admirable memories, to retain all the proofs which, upon a due examination, made them embrace that side of the question. It suffices, that they have once, with care and fairness, sifted the matter as far as they could; and having once found on which side the probability appeared to them, they lay up the conclusion in their memories, as a truth they have discovered; and for the future remain satisfied with the testimony of their memories, that this is the opinion, that, by the proofs they have once seen of it, deserves a degree of their assent as they afford it.

It is unavoidable then that the memory be relied on in this case, and that men be persuaded of several opinions, whereof the proofs are not actually in their thoughts, nay, which perhaps they are not able actually to recall: Without this the greatest part of men must be either sceptics, or change every moment, when any one offers them arguments which for want of memory, they are not presently able to answer.

It must be owned, that men flocking to past judgments, is often the cause of great obstinacy in error and mistake: For the fault is not that they rely on their memories for what they have before well judged, but because they judged before they had well examined. Who almost is there that hath the leisure, patience, and means, to collect together all the proofs concerning most of the opinions he has, so as safely to conclude, that he has a clear and full view, and that there is no more to be alleged for his better information? And yet we are forced to determine ourselves on one side, or other: The conduct of our lives, and the management of our great concerns, will not bear delay: For those depend, for the most part, on the determination of our judgment in points, wherein we are not capable of certain knowledge, and wherein it is necessary for us to embrace one side or the other.

The propositions we receive upon inducements of probability, are of two sorts: *First*, Concerning some particular existence, or matter of fact, which falling under our observation, is capable of human testimony; *Secondly*, Concerning things which, being beyond the discovery of our senses, are not capable of human testimony.

Concerning the first of these, viz. **Particular matter of fact**.

*First*, Where any particular thing, connotant to the connotant observation of ourselves, and others, in the like case, comes attested with the concurrent reports of all that mention it, we receive it as easily, and build as firmly upon it, as if it were certain knowledge. Thus, if all Englishmen, who have occasion to mention it, should report, that it froze in England last winter, or the like, a man would as little doubt of it, as that seven and four are eleven.

The first and highest degree of probability is, when the general consent of all men, in all ages, as far as can be known, concurs with a man's own concomitant experience in the like cases, to confirm the truth of any particular matter of fact, attested by fair witnesses: Such are the stated constitutions and properties of bodies, and the regular proceedings of causes and effects in the ordinary course of nature. This we call an argument from the nature of things themselves: For what we and others always observe to be after the same manner, we conclude with reason to be the effects of steady and regular causes, though they come not within the reach of our knowledge; as that fire warmed a man, or made lead fluid; that iron sunk in water, swam in quicksilver. A relation affirming any such thing to have been, or a predication that it will happen again in the same manner, is received without doubt or hesitation; and our belief thus grounded, rises to assurance.

*Secondly*, The next degree of probability, is when by my own experience, and the agreement of all others that mention it, a thing is found to be for the most part so; and that the particular instance of it is attested by many and undoubted witnesses. Thus history giving us such an account of men in all ages, and my own experience confirming it, that most men prefer their own private advantage to the public; if all historians that write of Tiberius, say that he did so, it is extremely probable: And in this case, our assent rises to a degree which we may call confidence.

*Thirdly*, In matters happening indifferently, as that a bird should fly this or that way; when any particular matter of fact comes attested by the concurrent testimony of unsuspected witneses, there our assent is also unavoidable. Thus, that there is in Italy such a city as Rome; that about one thousand and seven hundred years ago there lived such a man in it as Julius Caesar, &c. a man can as little doubt of this, and the like, as he does of the being and actions of his own acquaintance, whereof he himself is a witness.

**Probability**, on these grounds, carries so much evidence with it, that it leaves us as little liberty to believe or disbelieve, as demonstration does, whether we will know or be ignorant. But the difficulty is, when testimonies contradict common experience, and the reports of witneses clash with the ordinary course of nature, or with one another; here diligence, attention, and exactness, is required.
agitation of the imperceptible minute parts of the burning
jecture, guesses, doubt, wavering, distrust, &c. matter. This sort of probability, which is the best con-
duc of rational experiments, and the rise of hypothesis has also its use and influence. And a wary reasoning from
in analogy leads us often into the discovery of truths and
useful deductions, which would otherwise be concealed.

Though the common experience, and the ordinary course
of things, have a mighty influence on the minds of men,
to make them give or refuse credit to any thing proposed
to their belief; yet there is one case wherein the strange-
ness of the fact lessens not the agent to a fair testimony
given of it. For where such supernatural events are suit-
able to ends aimed at by Him who has the power to change
the course of nature, there, under such circumstances, they
may be the fitter to procure belief, by how much the more
they are beyond or contrary to ordinary observation. This
is the proper case of miracles; which, well attested, do
not only find credit themselves, but give it also to other
truths.

There are propositions that challenge the highest de-
gree of our assent upon bare testimony, whether the thing
proposed agree or disagree with common experience and
the ordinary course of things or no: The reason where-
of is, because the testimony is of such an one as cannot
deceive nor be deceived; and that is God himself. This
becomes with it, certainty beyond doubt, evidence beyond
exception. This is called by a peculiar name, revelation,
and our assent to it, faith, which has as much certainty
in it as our knowledge itself; and we may as well doubt
of our own being, as we can whether any revelation from
God be true. So that faith is a settled and sure princi-
ple of assent and assurance, and leaves no manner of
room for doubt or hesitation; only we must be sure, that
it be a divine revelation, and that we understand it
right, else we shall expose ourselves to all the extra-
-gancy of enthusiasm, and all the error of wrong principles,
if we have faith and assurance in what is not divine re-
velation.

Of reason.

The word reason, in English, has different signifi-
cations. Sometimes it is taken for true and clear prin-
ciples; sometimes for clear and fair deductions from those
principles; sometimes for the cause, and particularly for
the final cause: But the consideration we shall have of it
here, is as it stands for a faculty whereby man is suppos-
ed to be distinguished from beasts, and wherein it is evi-

dent he much surpasses them.

Reason is necessary, both for the enlargement of our
knowledge, and regulating our assent; for it hath to do
both in knowledge and opinion, and is necessary and af-

tilling to all our other intellectual faculties; and indeed
contains two of them, viz. first, Sagacity, whereby it
finds intermediate ideas; secondly, Ilation, whereby it
orders and disposes of them, as to discover what
connection there is in each link of the chain, whereby
the extremes are held together, and thereby, as it were,
to draw into view the truth sought for; which is that we
call Ilation, or inference, and consists in nothing but the
perception of the connection there is between the ideas
in each step of the deduction; whereby the mind comes to
see either the certain agreement or disagreement of any

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two ideas, as in demonstration, in which it arrives at
knowledge; or their probable connection, on which it
gives or with-holds its assent, as in opinion.

Sense and intuition reach but a little way: The great-
est part of our knowledge depends upon deductions and
intermediate ideas. In those cases where we must take
propositions for true, without being certain of their being
so, we have need to find out, examine, and compare the
grounds of their probability: In both cases, the faculty
which finds out the means, and rightly applies them to
discover certainty in the one, and probability in the other,
is that which we call reason: So that in reason we may
consider these four degrees; first, The discovering and
finding out of proofs; secondly, The regular and methodi-
cal disposition of them, and laying them in such order
as their connection may be plainly perceived; thirdly, The
perceiving their connection; fourthly, The making a right
conclusion.

There is one thing more which deserves to be considered
concerning reason; and that is, whether syllogism, as is
generally thought, be the proper instrument of it; and the
usefulest way of exercising this faculty. The causers to
doubt of it, are these:

First, Because syllogism serves our reason but in one
only of the formentioned parts of it; and that is, to shew
the connection of the proofs of any one instance, and no
more: But in this it is of no great use, since the mind
can perceive such connection, where it really is, as easil-
y, nay perhaps better, without it. We may observe, that
there are many men that reason exceeding clear and right-
y, who know not how to make a syllogism: And scarce
any one make syllogisms in reasoning within himself. In-
deed, sometimes they may serve to discover a fallacy, hid
in a rhetorical flourish; or by stripping an abdardity of the
cover of wit and good language, shew it in its naked de-
formity: But the weakness or fallacy of such a loose dis-
course it shews, by the artificial form it is put into, only
to those who have throughly studied mode and figure, and
have fo examined the many ways that three propositions
may be put together, as to know which of them does cer-
tainly conclude right, and which not, and upon what
grounds it is that they do so: But they who have not so
far looked into those forms, are not sure, by virtue of
syllogism, that the conclusion certainly follows from the
premises; the mind is not taught to reason by these rules;
it has a native faculty to perceive the coherence or inco-
herence of its ideas, and can range them right without
any such perplexing repetitions.

And to shew the weaknesses of an argument, there needs
no more but to strip it of the superfluous ideas, which,
blanded and confounded with those on which the infe-
rence depends, to shew a connection where there is
none, or at least do hinder the discovery of the want of
it; and then to lay the naked ideas, on which the force
of the argumentation depends, in their due order; in which
position the mind, taking a view of them, sees what con-
nection they have, and so is able to judge of the inference
without any need of syllogism at all.

Secondly, Because syllogisms are not less liable to fal-
lacies than the plainer ways of argumentation. And for
this we appeal to common observation, which has always
found these artificial methods of reasoning more adapted
to catch and entangle the mind, than to instruct and in-
form the understanding. And if it be certain that fallacy
can be couched in syllogisms, as it cannot be denied, it
must be something else, and not syllogism, that must dis-
cover them: But if men skilled in and used to syllogism,
find them affixing to their reason in the discovery of truth,
we think they ought to make use of them. All that we aim
at is, that they should not ascribe more to these forms
than belongs to them; and think that men have no ufe, or not
so full a ufe, of their reasoning faculty without them.

But however it be in knowledge, it is of far less, or no
ufe at all in probabilities: For the aften there being to
be determined by the preponderancy, after a due weight-
ing of all the proofs on both sides, nothing is so unfit to
affix the mind in that as syllogism; which running away
with one assumed probability, pursues that till it has led
the mind quite out of fight of the thing under considera-
don. But let it help us (as perhaps may be said) incorne-
menc of their errors or mistakes; yet full it fails our rea-
son in that part, which if not its highest perfection, is yet
certainly its hardest talk, and which that we most need its
help in; and that is, the finding out of proofs, and making
new discoveries. This way of reasoning discovers no new
proofs, but is the art of marshalling and arranging the old
ones we have already. A man knows first, and then he
is able to prove syllogically; so that syllogism comes af-
ter knowledge; and then a man has little or no need of it.
But it is chiefly by the finding out these ideas that shew
the connection of distant ones, that our flock of know-
lledge is increased, and that useful arts and sciences are
advanced.

Reason, though of a very large extent, fails us in se-
veral instances; as, first, Where our ideas fail. Second-
ly, It is often at a loss, because of the obscurity, confu-
nion, or imperfection of the ideas it is employed about.
Thus having no perfect idea of the least extent of
matter, or of infinity, we are at a loss about the divisibil-
ity of matter. Thirdly, Our reason is often at a stand,
because it perceives not thue ideas, which would serve to
shew the certain or probable agreement or disagreement
of any two other ideas. Fourthly, Our reason is often
engaged in absurdities and difficulties, by proceeding up-
on false principles, which being followed, lead men into
contradictions to themselves, and inconsistency in their
own thoughts. Fifthly, Dubious words, and uncertain
signs, often puzzle mens reason, and bring them to a
nonplus.

Though the deducing one proposition from another, be
a great part of reason, and that which it is usually em-
ployed about; yet the principal art of ratiocination, is
the finding the agreement or disagreement of two ideas
one with another, by the intervention of a third; as a
man, by a yard, finds two houses to be of the same length,
which could not be brought together to measure their e-
quality by juxtaposition: Words have their consequences
as the signs of such ideas; and things agree or dis-
agree, as really they are; but we observe it only by our
ideas.
METAPHYSICS.

In reasoning, men ordinarily use four sorts of arguments.

The first is to allege the opinions of men, whose parts, learning, eminency, power, or some other cause, has gained a name, and settled their reputation in the common esteem with some kind of authority: This may be called argumentum ad verecundiam.

Secondly, Another way is, to require the adversary to admit what they allege as a proof, or to affign a better: This is called argumentum ad hominem.

A third way, is to press a man with consequences drawn from his own principles or concessions: This is known under the name of argumentum ad hominem.

Fourthly, The using of proofs drawn from any of the foundations of knowledge or probability: This is called argumentum ad judicium. This alone, of all the four, brings true instruction with it, and advances us in our way to knowledge: For, first, It argues not another man’s opinion to be right, because I, out of respect, or any other consideration but that of conviction, will not contradict him. Secondly, It proves not another man to be in the right way, nor that I ought to take the same with him, because I know not a better. Thirdly, Nor does it follow, that another man is in the right way, because he has shewn me that I am in the wrong: This may dispose me, perhaps, for the reception of truth, but helps me not to it: That must come from proofs and arguments, and light arising from the nature of things themselves; not from my shame-facedness, ignorance, or error.

METAPLASTUS, in grammar, a transmutation or change made in a word, by adding, retrenching, or altering a letter or syllable thereof.

METASTASIS, in medicine, a transposition or settlement of some humour or disease on some other part; and sometimes it signifies such an alteration of a difeafe as is succeeded by a solution.


METATHESIS, in grammar, a figura whereby the letters or syllables of a word are transposed, or shifted out of their usual situation, as pilfris for prifris.

METEMPSYCHOSIS, the doctrine of transmigration, which supposes that human souls, upon leaving the body, become the souls of such kind of brutes as they must resemble in their manners.

This was the doctrine of Pythagoras and his followers; who, held that the souls of vicious men were imprisoned in the bodies of miserable beings; there to do penance for several ages, at the expiration whereof they returned again to animate men; but if they had lived virtuously, some happier brute, or even a human creature, was to be their lot. What led Pythagoras to this opinion was that soul was not of a perishable nature; whereas he concluded, that it must move into some other body upon its abandoning this. Lucan thinks this doctrine was contrived to mitigate the apprehension of death, by persuading men that they only changed their lodgings, and ceased to live only to begin a new life.

METEMPTOSIS, a term in chronology, expressing the solar equation, necessary to prevent the new moon from happening a day too late; by which it is opposed to premptos, which signifies the lunar equation necessary to prevent the new moon from happening a day too soon.

METEOR, in physiology, an imperfect, changeable, and mixt body, or the resemblance of a body appearing in the atmosphere, and formed by the action of the heavenly bodies, out of the common elements.

Metereors are of three kinds; fiery, airy, and watery. Fiery meteors consist of a fat sulphureous smoke set on fire; such as falling stars, draco volans, the ignis fatuus, and other phenomena, appearing in the air. Airy meteors consist of flatulent and spiritual exhalations, such as winds, &c. Watery meteors are composed of vapours, or watery particles, variously modified by heat and cold, such as clouds, rain, hail, snow and dew.

METEGLIN, a drink prepared of honey, one of the most pleasant and general drinks the northern parts of Europe afford. It is, according to Bailey, made as follows: Put as much raw honey naturally running from the comb, into spring water, as that, when the honey is thoroughly dissolved, an egg will not sink to the bottom, but be just suspended in it. Then boil the liquor for
for an hour or more, till such time as the egg swim above the fire; then take it off the fire, and let it cool. When very cool, next morning, it may be barreled up; and adding to it half an ounce of ginger, as much of cloves, as much of mace, and a quarter of an ounce of cinnamon. All gably poured, a spoonful of yeast may be added also at the bung to increase its fermentation. When it has done working, it may be closely stopped up; and after it has stood a month, it may be drawn off into bottles.

**METHOD.** the arrangement of our ideas in such a regular order, that their mutual connection and dependence may be readily comprehended.

**METHODISTS.** a name first given to a society of religious young men at Oxford, and now applied to all those who adhere to the doctrine of the church of England as taught by Whitefield, Wesley, &c. They are said to be, in general, plain well-meaning people, who do not differ from the established church; but profess to live with great purity, according to her articles. At their first appearance their teachers were charged, in the heat of their zeal, with several irregularities, and many expressions in their preaching which were not altogether unexceptionable; but as the civil government, with a moderation and wisdom peculiar to the present time, thought fit to overlook their behaviour, they have since honestly acknowledged wherein they were mistaken; and, in consequence of the perfect liberty of conscience they enjoy, have found into a more regular and peaceable conduct, agreeable to the genuine spirit of Christianity.

**METODISTS.** Methodici, is also an appellation given to a sect of ancient physicians, who reduced the whole healing art to a few common principles or appearances.

**METONYMY.** in rhetoric, is a trope in which one name is put for another, on account of the near relation there is between them. By this trope any of the most significant circumstances of a thing are put for the thing itself. The metonymy is used with most advantage in the following cases. 1. When the narration stands for the action, and what the poet or historian describes he is said to do; which is a lively manner of expression, exceeding the common, as much as action goes beyond description, or life excels painting. 2. When the name of any relation is put for the duty it requires, and the benevolence and tendernefs that may be expected from it. Thus Anacreon says, that through money there is no longer any such thing as brethren or parents in the world. 3. When the word which is used for a proper name, is either taken from the person’s country, family, profession, personal circumstance, or resemblance to some other; thus, as Sardanapalus was a monster of debauchery, and Nero of cruelty, to call any debauched person a Sardalapalus, and a cruel one Nero, brands them much deeper than to call one debauched, and the other cruel.

**METOP.** in architecture, is the interval, or square space between the triglyphs of the doric frieze, which among the ancients used to be painted or adorned with carved work, representing the heads of oxen, or utensils used in sacrifices.

**METOPES.** in architecture, is the interval, or square above the liquor; then take it off the fire, and let it cool. When very cool, next morning, it may be barreled up; and adding to it half an ounce of ginger, as much of cloves, as much of mace, and a quarter of an ounce of cinnamon. All gably poured, a spoonful of yeast may be added also at the bung to increase its fermentation. When it has done working, it may be closely stopped up; and after it has stood a month, it may be drawn off into bottles.

**METOPOGRAPHY.** the pretended art of knowing a person’s disposition and manners, by viewing the traces and lines in the face.

**METRE.** in poetry, a system of feet of a just length.

The different metres in poetry, are the different manners of ordering and combining the quantities, or the long and short syllables; thus hexameter, pentameter, iambic, sapphic verses, &c. consist of different metres, or measures.

In English verses, the metres are extremely various and arbitrary, every poet being at liberty to introduce any new form that he pleases. The most usual are the heroic, generally consisting of five long and five short syllables, and verses of four feet, and of three feet and a half, or single syllable.

**METRETES.** an ancient measure of capacity, containing a little more than nine gallons.

**METROPOLIS.** the capital or principal city of a country or province.

The term metropolis is also applied to archiepiscopal churches, and sometimes to the principal or mother church of a city.

**METZ.** a city of Germany, in the duchy of Lorraine, capital of the bishopric of Metz, situated thirty miles north of Nancy.

**MEXICO.** the metropolis of New Spain at present, and formerly of the empire of Mexico, situated in W. long. 103°, N. lat. 20°.

This province of New Spain in America is now divided into Old and New Mexico.

**Old Mexico,** situated between 83 and 116 degrees of W. long. and between 8 and 28 degrees N. lat. is bounded by New Mexico, or Granada, on the north; by the gulf of Mexico, on the north-east; by Terra-firma, on the south-east; and by the Pacific Ocean, on the south-west.

**New Mexico,** including California, situated between 100 and 140 degrees of W. long. and between the Tropic of Cancer and 48 degrees of N. lat. is bounded by unknown lands on the north, by Florida on the east, by Old Mexico on the south, and by the Pacific Ocean on the west.

**MEZZOTINTO.** a particular manner of representing figures on copper, so as to form prints in imitation of painting in Indian ink.

The manner of making mezzotintos is very different from all other kinds of engraving and etching, since instead of forming the figures with lines and scratches made with the point of a graver, or by means of aquafortis, they are wholly formed by scraping and burnishing. Mezzotintos are made in the following manner: take a well-polished copper-plate, and beginning at the corner, rake or burnish the surface all over with a knife or instrument made for the purpose, first one way, and then the other, till the whole is of a regular roughness, without the least smooth part to be seen; in which state, if a paper was to be worked off from it at the copper-plate press, it would be all over black. When this is done, the plate is rubbed over with charcoal, black chalk, or black lead, and then the design is drawn with white chalk; after which the cut-lines are traced out.
MIDWIFERY is the art of assisting nature in bringing forth a perfect foetus, or child, from the womb of the mother.

The knowledge of this art depends greatly on an intimate acquaintance with the anatomy of the parts of generation in women, both internal and external. But, as those have already been fully described under the article Anatomy, we must refer to the different parts of that science upon which the knowledge of midwifery depends.

For the Bones of the Pelvis, see Anatomy, p. 171, &c.

For the Parts of Generation in Females, both external and internal, see Anatomy, p. 274, &c.

For the different theories of Conception, see Generation.

Of the Increase of the Uterus after Conception.

It is supposed, that the ovum swims in a fluid, which absorbs so as to increase gradually in magnitude, till it comes in contact with all the inner surface of the fundus uteri; and this being diffused in proportion to the augmentation of its contents, the upper part of the neck begins also to be stretched.

About the third month of gestation, the ovum in big- nes equals a goose egg; and then nearly one fourth of the neck, at its upper part, is diffused equal with the fundus. At the fifth month, the fundus is increased to a much greater magnitude, and rises upwards to the middle space between the upper part of the pubes and the navel; and at that period, one half of the neck is extended. At the seventh month, the fundus reaches as high as the navel; and at the eighth month, it is advanced midway between the navel and febrochis cordis; and in the ninth month, is raised quite up to this last mentioned part, the neck of the womb being then altogether diffused. See Plate CXI, fig. 1, 2, 3.

2

Fig. 1.

MICROCOSM, a Greek term, signifying the little world; used by some for man, as being supposed an epitome of the universe or great world.

MICROGRAPHY, the description of objects too minute to be viewed without the assistance of a microscope. See Microscope.

MICROMETER, a machine, which, by means of a screw, serves to measure extremely small distances to a great degree of accuracy.

MICROPUS, in botany, a genus of the syngenesia polygamy class. The receptacle is palleaceous; it has no pappus; and the corolla have no radii. There are two species, none of them natives of Britain.

MICROSOPHCS, a genus of the polyandria class. The calix consists of eight segments, and the corolla of eight petals; and the berries contain many seeds. There is but one species, a native of India.

MICROCOS, in botany, a genus of the polyandria mogyinia class. The calix consists of five leaves, and the corolla of five petals. There are two species, both natives of India.

MICROSOPE, an optical instrument, by means whereof the univerfe or great world.

MICROSOPHCS, a genus of the polyandria class. The calix consists of five leaves, and the corolla of five petals. There are two species, both natives of India.

MICROSCOPE, an optical instrument, by means whereof very minute objects are represented. See Optics.
Fig. 1. Gives a front-view of the uterus in situ suspended in the vagina; the anterior parts of the os ilium, with the os pubis, pudenda, perineum, and anus, being removed in order to shew the internal parts.

A, The last vertebra of the loins.
BB, The os ilium.
CC, The acetabula.
DD, The inferior and posterior parts of the os ilium.
E, The part covering the extremity of the coccyx.
F, The inferior part of the rectum.
GG, The vagina cut open longitudinally, and stretched on each side of the collum uteri, to shew in what manner the uterus is suspended in the same.
HH, Part of the vesica urinaria stretched on each side of the vagina, and inferior part of the fundus uteri.
I, The collum uteri.
K, The fundus uteri.
LL, The tubi Fallopiani and fimbrine.
MM, The ovaria.
NN, The ligamenta lata and rotunda.
OO, The superior part of the rectum.

Fig. 2. Gives a front-view of the uterus in the beginning of the first month of pregnancy; the anterior part being removed that the embryo might appear through the amnios, the chorion being detached off.

A, The fundus uteri.
B, The collum uteri, with a view of the rugous canal that leads to the cavity of the fundus.
C, The os uteri.

Fig. 3. In the same view and section of the parts as in fig. 1. shews the uterus as it appears in the second or third month of pregnancy.

A, The fundus uteri.
B, The collum uteri, with a view of the rugous canal that leads to the cavity of the fundus.
C, The os uteri.
D, The anus.
G, The vagina, with its plicae.
HH, The posterior and inferior part of the urinary bladder extended on each side; the anterior and superior part being removed.
II, The mouth and neck of the womb, as raised up when examining the same by the touch, with one of the fingers in the vagina.
KK, The uterus as stretched in the second or third month, containing the embryo, with the placenta adhering to the fundus.

Now that the whole substance of the uterus is stretched, the neck and os internum, which were at first the strongest, become the weakest part of the womb, and the stretching force being still continued by the increase of the fetus and fecundines, which are extended by the enclosed waters in a globular form, the os uteri begins gradually to give way. In the beginning of its dilatation, the nervous fibres in this place, being more sensible than any other part of the uterus, are irritated, and yield an uneasy sensation; to alleviate which, the woman squeezes her uterus, by contracting the abdominal muscles, and at the same time filling the lungs with air, by which the diaphragm is kept down; the pain being rather increased than abated by this straining, is communicated to all the neighbouring parts, to which the ligaments and vessels are attached, such as the back, loins, and inside of the thighs; and by this compression of the uterus, the waters and membranes are pressed against the os uteri, which is, of consequence, a little more opened. See fig. 4, 5, 6. of Plate-CXI.

Fig. 4. In the same view and section of the parts with the former figures, represents the uterus in the eighth or ninth month of pregnancy.

A, The uterus as stretched to near its full extent, with the waters, and containing the fetus entangled in the funis, the head presenting at the upper part of the pelvis.
BB, The superior part of the os ilium.
CC, The acetabula.
DD, The remaining posterior parts of the os ilium.
E, The coccyx.
F, The inferior part of the rectum.
GGG, The vagina stretched on each side.
H, The os uteri, the neck being stretched to its full extent or entirely obliterated.
II, Part of the vesica urinaria.
KK, The placenta, at the superior and posterior part of the uterus.
LL, The membranes.
M, The funis umbilicalis.

Fig. 5. Gives a front view of twins in utero in the beginning of labour.

A, The uterus as stretched, with the membranes and waters.
BB, The superior parts of the os ilium.
CC, The acetabula.
DD, The os ilium.
E, The coccyx.
F, The inferior part of the rectum.
GG, The vagina.
H, The os internum stretched open about a finger-breadth, with the membranes and waters in time of labour-pains.
II, The inferior part of the uterus, stretched with the waters, which are below the head of the child that presents.

KK, The two placentas adhering to the posterior part of the uterus, the two fetus's lying before them, one with its head in a proper position at the inferior part of the uterus, and the other situated preternaturally with the head to the fundus; the bodies of each are here entangled in their proper funis, which frequently happens in the natural as well as preternatural positions.

LLL, The membranes belonging to each placenta.

Fig. 6. Shews, in a lateral view and longitudinal division of the parts, the gravid uterus when labour is somewhat advanced.

A, The lowest vertebra of the back; the distance from which to the last mentioned vertebra is here shown by dotted lines.
CC, The usual thickness and figure of the uterus when extended by the waters at the latter end of pregnancy.
M I D W I F E R Y.

D, The same contracted and grown thicker after the waters are evacuated.
EE, The figure of the uterus when pendulous.
FF, The figure of the uterus when stretched higher than usual, which generally occasions vomitings and difficulty of breathing.
G, The os pubis of the left side.
HH, The os internum.
I, The vagina.
K, The left nympha.
L, The labium pudendi of the same side.
M, The remaining portion of the bladder.
N, The anus.
OP, The left hip and thigh.
The woman being unable to continue this effort, for any length of time, from the violence of the pain it occasions, and the strength of the muscles being thereby a little exhausted and impaired, the contracting force abates; the tension of the os times being taken off, it becomes more soft, and contracts a little; so that the nervous fibres are relaxed. This remission of pain the patient enjoys for some time, until the fame increasing force renews the stretching pains, irritation, and something like a tearing of the os uteri; the compression of the womb again takes place, and the internal mouth is a little more dilated, either by the pressure of the waters and membranes, or when the fluid is in small quantity, by the child's head forced down by the contraction of the uterus, which in that case is in contact with the body of the fetus. See Plate CXI. where

Fig. 7. Shews the forehead of the fetus turned backwards to the os facrum, and the occupit below the pubes, by which means the narrow part of the head is to the narrow part of the pelvis, that is, between the inferior parts of the os sacrum.
A, The uterus contracted closely to the fetus after the waters are evacuated.
BCCD, The vertebrae of the loins, os sacrum, and coccyx.
E, The anus.
F, The left hip.
G, The perineum.
H, The es externum beginning to dilate.
I, The os pubis of the left side.
K, The remaining portion of the bladder.
L, The posterior part of the os uteri.
In this manner the labour pains begin, and continue to return periodically, growing stronger and more frequent, until the os uteri is fully dilated, and the membranes are depressed and broke; so that the waters are discharged, the uterus contracts, and, with the assistance of the muscles, the child is forced along and delivered.

Of Abortions.
A miscarriage that happens before the tenth day, was formerly called an efflux, because the embryo and fecundines are not then formed, and nothing but the liquid conception, or genitura, is discharged. From the tenth day to the third month it was known by the term expulsion, the embryo and fecundines being still so small, that the woman is in no great danger from violent flooding.

If she parted with her burden betwixt that period and the seventh month, she was said to suffer an abortion; in which case she underwent greater danger, and was delivered with more difficulty than before; because the uterus and vessels being more distended, a larger quantity of blood was lost in a shorter time, the fetus was increased in bulk, and the neck of the womb is not yet fully stretched: besides, should the child be born alive, it will be so small and tender that it will not suck, and scarce receive any sort of nourishment.

When delivery happens between the seventh month and full time, the woman is said to be in labour: but, instead of these distinctions, if she loses her burden at any time from conception to the seventh or eighth, or even in the ninth month, we now lay indiscriminately, she has miscarried.

The common term of pregnancy is limited to nine solar months, reckoning from the last discharge of the catamenia: yet in some, though very few, uterine delivery exceeds that period.

Of false Conceptions and Moles.
It was formerly supposed, that if the parts of the embryo and fecundines were not separated and distinctly formed from the mixture of the male and female semen, they formed a mass, which, when discharged before the fourth month, was called a false conception; if it continued longer in the uterus, so as to increase in magnitude, it went under the denomination of a mole. But these things are now to be accounted for in a more probable and certain manner. Should the embryo die (suppose in the first or second month,) some days before it is discharged, it will sometimes be entirely dissolved; so that, when the fecundines are delivered, there is nothing else to be seen. In the first month, the embryo is so small and tender, that this dissolution will be performed in twelve hours: in the second month, two, three, or four days will suffice for this purpose; and even in the third month, it will be dissolved in fourteen or fifteen: besides the blood frequently forms thick lamina round the ovum, to the surface of which they adhere so strongly, that it is very difficult to distinguish what part is placenta, and what membrane. Even after the embryo and placenta are discharged, in the second or third month, the mouth and neck of the womb are often so closely contracted, that the fibrous part of the blood is retained in the fundus, sometimes to the fifth or seventh day; and when it comes off, exhibits the appearance of an ovum, the external surface, by the strong preffure of the uterus, resembling a membrane; so that the whole is mistaken for a false conception.

This substance, in bigness, commonly equals a pigeon or hen egg; or if it exceeds that size, and is longer retained, is distinguished by the appellation of mole: but this last generally happens in women betwixt the age of forty-five and fifty, or later, when their menses begin to disappear; sometimes from internal or external accidents that may produce continued floodings. If the catamenia have
have ceased to flow for some time in elderly women, and return with pain, such a symptom is frequently the forerunner of a cancer; before or after this happens, sometimes a large fluid-like substance will be discharged with great pain, resembling that of labour; and upon examination, appears to be no more than the fibrous part of the blood, which assumes that form by being long pressed in the uterus or vagina.

In this place, it will not be amiss to observe, that the glands of the uterus and vagina will sometimes increase, and differ the adjacent parts to a surprising degree; if (for example) one of the glands of the uterus be so obstructed as that there is a pressure on the returning vein and excretory duct, the arterial blood will gradually stretch the smaller vessels, and consequently increase the size of the gland, which will grow larger and larger, as long as the force of the impelled fluid is greater than the resistance of the vessels that contain it; by which means, a very small gland will be enlarged to a great bulk, and the uterus gradually stretched as in uterine gestation, though the progress may be so slow as to be protracted for years instead of months. Nevertheless, the os internum will be dilated, and the gland (if not too large to pass) will be squeezed into the vagina, provided it adheres to the uterus, by a small neck; nay, it will lengthen more and more, so as to appear on the outside of the os externum; in which case, it may be easily separated by a ligature. This disease will be the sooner known and easier remedied, the lower its origin in the uterus is. But should the gland take its rise in the vagina, hard by the mouth of the womb, it will swell itself still sooner, and a ligature may be easily introduced, provided the tumour is not so large as to fill up the cavity and hinder the neck of it from being commodiously felt. Though the greatest difficulty occurs, when the gland is confined to the uterus, being too much enlarged to pass through the os internum.

Sometimes all, or most of the glands in the uterus are thus affected, and augment the womb to such a degree, that it will weigh a great many pounds, and the woman is destroyed by its pressure upon the surrounding parts: but, should this indolent state of the tumour be altered by any accident that will produce irritation and inflammation, the parts will grow chilurous, and a cancer ensue.

This misfortune, for the most part, happens to women, when their menstrual evacuations leave them; and sometimes (though seldom) to child-bearing women, in consequence of severe labour.

Of the Placenta.

The ovum is formed of the placenta with the chorion and amnion, which are globularly distended by the incrusted waters that surround the child. The placenta is commonly of a round figure, somewhat resembling an oatcake, about six inches in diameter, and one inch thick in the middle, growing a little thinner towards the circumference; it is composed of veins and arteries, which are divided into an infinite number of small branches, the venous parts of which unite in one large tube, called the umbilical vein, which brings back the blood, and is supposed to carry along the nutritive fluid from the vessels of the chorion and placenta, to the child, whose belly it perforates at the navel; from thence passing into the liver, where it communicates with the vena portarum and cava. It is furnished with two arteries, which arise from the internal iliacs of the child, and running up on each side of the bladder, perforates the belly where the umbilical vein entered; then they proceed to the placenta, in a spiral line, twining round the vein, in conjunction with which they form the funiculus umbilicalis, which is commonly four or five hand breadths in length, sometimes only two or three, and sometimes it extends to the length of eight or ten. The two arteries, on their arrival at the inner surface of the placenta, are divided and subdivided into minute branches, which at last end in small capillaries that inoculate with the veins of the same order. These arteries, together with the umbilical vein, are supposed to do the same office in the placenta which is afterwards performed in the lungs by the pulmonary artery and vein, until the child is delivered and begins to breathe; and this opinion seems to be confirmed by the following experiments. If the child and placenta are both delivered suddenly, or the last immediately after the first; and if the child, though alive, does not yet breathe; the blood may be felt circulating, sometimes slowly, at other times with great force, through the arteries of the funis to the placenta, and from thence back again to the child, along the umbilical vein. When the vessels are slightly pressed, the arteries swell between the pressure and the child, while the vein grows turgid between that and the placenta, from the surface of which no blood is observed to flow, although it be lying in a bason, among warm water. As the child begins to breathe, the circulation, though it was weak before, immediately grows stronger and stronger, and then in a few minutes the pulsation in the navel-string becomes more languid, and at last entirely flops. If, after the child is delivered, and the navel-string cut, provided the placenta adheres firmly to the uterus, which is thereby kept extended; or, if the womb is still distended by another child; no more blood flows from the umbilical vessels, than what seemed to be contained in them at the instant of cutting; and this, in common cases, does not exceed the quantity of two or three ounces; and finally, when, in consequence of violent floodings, the mother expires, either in time of delivery, or soon after it, the child is sometimes found alive and vigorous, especially if the placenta is found; but if loose, then the child will lose blood as well as the mother.

The external surface of the placenta is divided into several lobes, that it may yield and conform itself more commodiously to the inner surface of the uterus, to which it adheres, so as to prevent its being separated by any shock or blows upon the abdomen, unless when violent. These groups of veins and arteries which enter into the composition of the placenta receive external coats from the chorion, which is the outward membrane of the ovum, thick and strong, and forms three fourths of the external globe that contains the waters and the child; the remaining part being covered by the placenta; so that these two in conjunction constitute the whole external surface of the ovum. Some indeed allege, that these are enveloped with a cribriform or cellular substance, by which
which they seem to adhere by contact only, to the uterus; and that the inner membrane of the womb is full of little glands, whose excretory ducts opening into the fundus and neck, secrete a soft thin mucus, to lubricate the whole cavity of the uterus, which beginning to stretch in time of gestation, the vessels that compose these glands are also diffused; consequently, a greater quantity of this mucus is separated and retained in this cribriform and cellular substance, the absorbing vessels of which take it in, and convey it along the veins, for the nourishment of the child. The womb being therefore diffused in proportion to the increase of the child, those glands are also proportionably enlarged; by which means, a larger quantity of the fluid is separated, because the nourishment of the child must be augmented in proportion to the progress of its growth; and this liquor undergoes an alteration in quality as well as in quantity, being changed from a clear thin fluid into the more viscous consistence of milk. In some cases this mucus hath been discharged from the uterus in time of pregnancy, and both mother and child weakened by the evacuation, which may be occasioned by the chorion's adhering too loosely, or being in one part actually separated from the womb.

Formerly, it was taken for granted by many, that the placenta always adhered to the fundus uteri; but this notion is refuted by certain observations, in consequence of which we find it as often flicking to the sides, back and fore parts, and sometimes as far down as the inside of the os uteri. See Plate CXXI.

When the placenta is delivered, and no other part of the membrane tore except that through which the child passed, the opening is near the edge or side of the placenta, and seldom in the middle of the membranes; and a hog's bladder being introduced at this opening, and inflated, when lying in water, will shew the shape and size of the inner surface of the womb, and plainly discover the part to which the placenta adhered.

The chorion is, on the inside, lined with the amnion, which is a thin transparent membrane, without any vessels so large as to admit the red globules of blood; it adheres to the chorion by contact, and seems to form the external coat of the funis umbilicalis.

This membrane contains the ferum, in which the child swims; which fluid is supposed to be furnished by lymphatic vessels that open into the inner surface of the amnion. If this liquid be neither absorbed into the body of the foetus, nor taken into the stomoch by suction at the mouth, there must be absorbing vessels in this membrane, in the same manner as in the abdomen and other cavities of the body, where there is a constant renovation of humidity.

The quantity of this fluid, in proportion to the weight of the foetus, is much greater in the first than in the last month of gestation, being in the one perhaps ten times the weight of the embryo; whereas, in the other, it is commonly in the proportion of one to two: for, six pounds of water surrounding a foetus that weighs twelve pounds, is reckoned a large proportion, the quantity being often much less; nay, sometimes there is very little or none at all.

In most animals of the brute species, there is a third membrane called allantois, which resembles a long and wide blind-gut, and contains the urine of the foetus: it is situated between the chorion and amnion, and communicates with the urachus that rises from the fundus of the bladder, and runs along with the umbilical vessels, depositing the urine in this reser voir, which is attached to its other extremity. This bag hath not yet been certainly discovered in the human foetus, the urachus of which, though plainly perceivable, seems hitherto to be quite imperforated.

From the foregoing observations upon nutrition, it seems probable, that the foetus is rather nourished by the absorption of the nutritive fluid into the vessels of the placenta and chorion, than from the red blood circulated in full stream from the arteries of the uterus to the veins of the placenta, and returned by the arteries of the left to the veins of the right, in order to be renewed, refined, and made arterial blood in the lungs of the mother.

Of the Child's situation in the Uterus.

The embryo or foetus, as it lies in the uterus, is nearly of a circular or rather oval figure, which is calculated to take up as little space as possible: the chin rests upon the breast, the thighs are pressed along the belly, the heels applied to the breech, the face being placed between the knees, while the arms cross each other round the legs. The head, for the most part, is down to the lower part of the uterus; and the child being contracted into an oval form, the greatest length is from head to breech: but the distance from one side to the other is much less than that from the fore to the back part; because the thighs and legs are doubled along the belly and stomoch, and the head bended forwards on the breast.

The uterus being confined by the vertebrae of the loins, the distance from the back to the fore-part of it must be less than from side to side; so that, in all probability, one side of the foetus is turned towards the back, and the other to the fore-part of the womb; but, as the back part of the uterus forms a little longitudinal cavity on each side of the vertebræ, the fore-parts of the foetus may therefore for the most part tilt more backwards than forwards.

It has been generally supposed, that the head is turned up to the fundus, and the breech to the os uteri, with the fore-parts towards the mother's belly; and that it remains in this situation till labour begins, when the head comes downwards, and the face is turned to the back of the mother. Some allege, that the head precipitates about the end of the eighth or beginning of the ninth month, by becoming specifically heavier than the rest of the body. Others affirm, that as the child increases in bulk, especially during the two last months, the proportion of surrounding water must be diminished, so that it is confined in its motion, and, in struggling to alter its position, the head is moved to the os tunicæ, where it remains till delivery. The particulars of this and other theories may be found in Mauriceau, Le Motte, Simpson, and Old. But, from the following observations, it seems more probable, that the head is, for the most part, turned down to the lower part of the uterus from conception to delivery.

In the first month, according to some writers, the embryo
bryo exhibits the figure of a tadpole, with a large head and small body or tail, which gradually increases in magnitude, till the arms and thighs begin to bud or strut out, like small nipples, from the shoulders and breech: two black specks appear on each side of the head, with a little hole or opening between them, which in the second month are easily distinguished to be the eyes and mouth. See Plate CXI. fig. 2. The legs and arms are gradually formed, while the body turns larger; but the fingers are not separated or distinct, till the latter end of the second or beginning of the third month. See Plate CXI. fig. 3. This is commonly the case; but sometimes the bulk and appearance differ considerably in different embryos of the same age. The younger the embryo, the larger and heavier is the head in proportion to the rest of the body; and this is the case in all the different gradations of the fetus; so that when dropped or suspended by the navel string in water, the head must sink lowermost of course. Besides, when women miscarry in the fourth, fifth, sixth, and seventh months, the head for the most part presents itself, and is first delivered. See Plate CXI. fig. 3. By the touch in the vagina, the head is frequently felt in the seventh, sometimes in the sixth, but more frequently in the eighth month; and if the same women are thus examined, from time to time, till the labour begins, the head will always be felt of a round firm substance at the fore-part of the brim of the pelvis, betwixt the os internum and pubes, through the substance of the vagina and uterus. See Plate CXI. fig. 4. But all these opinions are liable to objections. If the descent of the head proceeded from its specific gravity, we would always find it at the os internum, because this reason would always prevail; but it was owing to a diminution of water, why should we often find the breek presented, even when there is a quantity of that fluid large enough to give the head free liberty to rise again towards the fundus, or (according to the other opinion) to sink down by its specific gravity to the os internum? Some, indeed, suppose, that the head always presents itself, except when it is hindered by the funis umbilicalis twisting round the neck and body, so as to impede the natural progress: but, were this supposition just, when we turn and deliver by the feet those children that presented in a preternatural way, we should always find them more or less circumscribed by the navel string: the funis is as often found twirled round the neck and body when the head presents as in any other case. That the head is downwards all the time of gestation, seems, on the whole, to be the most reasonable opinion, though it be liable to the objection already mentioned, and seems contradictory to the observation of some authors, who allege, that in opening women that died in the fifth, sixth, or seventh month, they have found the child's head towards the fundus uteri. But as it lies as easly in one posture as in another, till the birth, this dispute is of less consequence in the practice of midwifery. It may be useful to suggest, that the wrong posture of the child in the uterus may proceed,

1. From circumvolutions in the funis umbilicalis. See Plate CXIII. fig. 1, which represents, in a front view of the pelvis, the breech of the fetus presenting, and dilating the os internum, the membranes being too soon broke. The fore-parts of the child are to the posterior part of the uterus; and the funis, with a knot upon it, surrounds the neck, arms, and body.

Or, 2. When there is little or no water surrounding the child, it may move into a wrong position, and be confined there by the structure of the uterus. See Plate CXIII. fig. 2, 3, 4.

Fig. 2. is the reverse of fig. 1, the fore-parts of the child being to the fore-part of the uterus.

Fig. 3. represents, in a front view of the pelvis, the fetus comprized, by the contraction of the uterus, into a round form, the fore-parts of the former being towards the inferior part of the latter, and one foot and hand fallen down into the vagina. In this figure, the anterior part of the pelvis is removed, by a longitudinal section through the middle of the foramen magnum.

AA, The superior parts of the offa ilium.
BB, The uterus.
C, The mouth of the womb stretched and appearing in OOOO, The vagina.
D, The inferior and posterior part of the os externum.
EEEE, The remaining parts of the olla pubis and ischium.
FFFF, The membrana adiposa.

Fig. 4. represents, in the same view with fig. 3, the fetus in the contrary position; the breech and fore-parts being towards the fundus uteri, the left arm in the vagina, and the fore arm without the os externum, the shoulder being likewise forced into the os uteri.

Or, lastly, The wrong position of the child may be the effect of a pendulous belly or narrow pelvis, when the head lies forward over the pubis. See Plate CXI. fig. 6. See also Plate CXII. fig. 6 and 7.

Fig. 6. gives a lateral internal view of a distended pelvis, divided longitudinally, with the head of a fetus of the seventh month passing the same.

ABC, The os facrum and coccyx.
D, The pubis of the left side.
E, The tuberolithy of the os ischihialm of the same side.
F, The processus acutus.
G, The foramen magnum.

OF TOUCHING.

Touching is performed by introducing the fore-finger lubricated with pomatum into the vagina, in order to feel the os internum and neck of the uterus; and sometimes into the rectum, to discover the stretching of the fundus. By some, we are advised to touch with the middle finger, as being the longest; and by others, to employ both that and the first: but the middle is too much encumbered by that on each side, to answer the purpose fully,
fully; and when two are introduced together, the patient never fails to complain. The design of touching is to be informed whether the woman is, or is not with child; to know how far she is advanced in her pregnancy; if she is in danger of miscarriage; if the os uteri be dilated; and in time of labour to form a right judgment of the cafe, from the opening of the os internum, and the pressing down of the membranes with their waters; and lastly, to distinguish what part of the child is presented.

It is generally impracticable to discover, by a touch in the vagina, whether or not the uterus is impregnated, till after the fourth month: then the best time for examination is the morning, when the woman is fasting, after the contents of the bladder and rectum have been discharged; and the surgeon, if necessary, to submit to the inquiry in a standing posture; because, in that case, the uterus hangs lower down in the vagina, and the weight is more sensible to the touch than when she lies reclined. One principal reason of our uncertainty is, when we try to feel the neck, the womb rises up against the vagina, at the side of the os internum, (see Plate CXI. fig. 3.) and in some, the vagina feels very tense; but, when the fundus uteri is advanced near the navel, the pressure from above keeps down the os internum so much, that you can generally feel both the neck, and above that, the stretching of the under part of the uterus. See Plate CXI. fig. 3.

There is no considerable variation to be felt in the figure of the os internum, except in the latter end of pregnancy, when it sometimes grows larger and fatter, (see Plate CXI. fig. 4.) nor do the lips seem to be more closed in a woman with child than in another, especially in the beginning of pregnancy: but, in both cases the os uteri is felt like the mouth of a young puppy or tench. In some the lips are very small; in others, large; and sometimes, though seldom, smoothened over or pointed. In many women, who have formerly had children and difficult labours, the lips are large, and so much separated, as to admit the tip of an ordinary finger; but a little higher up, the neck seems to be quite closed.

In the first four months, the neck of the womb may be felt hanging down in the vagina, by pulling up the finger by the side of the os internum; but the stretching of the uterus and upper part of the neck cannot be perceived till the fifth, and sometimes the sixth month; and even then, the uterus must be kept down by a strong pressure upon the belly.

The stretching of the fundus is sometimes felt by the finger introduced into the rectum, before it can be perceived in the vagina; because, in this last method, the uterus recedes from the touch, and rises too high to be accurately distinguished; whereas the finger being introduced into the rectum, passes along the back of the womb almost to the upper part of the fundus, and in a unimpregnated state, is felt flat on the back part, and jutting out at the sides; but the impregnated uterus is perceived like a large round tumour.

About the fifth or sixth month, the upper part of the uterus is so much stretched, as to rise three or four inches above the os pubis, or to the middle space between that and the navel; so that, by pressing the hand on the belly, especially of lean women, it is frequently perceived; and if, at the same time, the index of the other hand be introduced in the vagina, the neck will seem shortened, particularly at the front part and sides, and the weight will be sensibly felt; but, if the parts of the abdomen are stretched after eating, one may be deceived by the pressure of the stomach, because weight and pressure are the same. But all these signs are more perceptible towards the latter end of pregnancy; and in some women the os internum is felt a little open some weeks before the full time, though generally it is not opened till a few days before labour begins.

From the fifth to the ninth month, the neck of the uterus becomes shorter and shorter, and the stretching of the womb grows more and more perceptible. In the seventh month, the fundus rises as high as the navel; in the eighth month, to the middle space between the navel and the scrobiculus cordis; and in the ninth, even to the scrobiculus, except in pendulous bellies; See Plate CXI. fig. 4. But all these marks may vary in different women, for when the belly is pendulous, the parts below the navel are much more stretched than those above, and hang over the os pubis; the fundus will then be only equal to, or a little higher than the navel; at other times, the uterus will rise in the latter end of the seventh or eighth month to the scrobiculus cordis. The neck of the womb will, in some, be felt as long in the eighth, as in others in the sixth or seventh month. This variation sometimes makes the examination of the abdomen more certain than the touch of the vagina; and so vice versa. At other times we must judge by both. See Plate CXI. fig. 6.

Of the signs of Conception, and the equivocal signs of pregnant and obstructed women.

The signs of pregnancy are to be distinguished from those that belong to obstructions, by the touch in the vagina and motion of the child, in the fifth or sixth month; sometimes, by the touch in the rectum, before and after the fifth month, when the tumour of the abdomen is plainly perceived.

Most women, a day or two before the irritation of the catamenia, labour under complaints proceeding from a plethora; such as stretching pains in the back and loins, in the thighs, breast and head; a stickiness and oppression at the stomach, and a fullness of all the visceras of the abdomen; and all these symptoms abate, and gradually vanish, when the discharge begins and continues to flow. But, if the woman be obstructed by any accident or error in the non-naturals, all these complaints continue and increase, and are hardly distinguishable from the symptoms of pregnancy, till the end of the fourth month; at which period, women with child grow better, and all the complaints of fullness gradually wear off; whereas, those, who are only obstructed, grow worse and worse.

The fundus uteri, in the obstructed patient, is not stretched; the disorder in the stomach is not so violent as in a pregnant woman, and seldom accompanied with reachings; while the women with child are afflicted with a reaching every morning, and subject to longings before the first labours under a fulness of the vessels; the last, over and above this complaint, suffers an additional one from the
the division of the uterus by the impregnated ovum. Obstiruptions and pregnancy are both accompanied by a stretching of the uterus in the breasts; but in the last only, it may be perceived the areola, or brown ring, round the nipples, from which, in the last month, a thin film diffils; but this circle is not always to be discernible as in the first pregnancy, and even then is uncertain as well as the others.

About the fifth or sixth month, the circumfered tumour or stretching of the uterus is felt above the os pubis; and, by this circumfered and confident, easily distinguished from the alicites, or dropsy of the abdomen: it is also rounder and firmer than those swellings that accompany obstiruptions, which proceed from a general fullness of the vessels belonging to the ligaments and neighbouring viscer.

On the whole, the difficulty of distinguishing between obstiruptions and pregnancy in the first months, is so great, that we ought to be cautious in giving our opinion; and never prescribe such remedies as may endanger the fruit of the womb; but rather endeavour to palliate the complaints, until time shall discover the nature of the case; and always judge on the charitable side, when life or reputation is at stake.

In the fifth or sixth month of uterine gestation, by the touch in the vagina, we perceive the neck of the womb considerably shortened, and the stretching of the lower part of the uterus is then feebly felt between the mouth of the womb and the pubes, and on each side of the neck. This is the only moment when the head can possibly be felt against the lower part of the uterus; but rather endeavour to palliate the complaints, until time shall discover the nature of the case; and always judge on the charitable side, when life or reputation is at stake. See Plate CXI. fig. 3.

In the seventh month, the head of the child is frequently felt resting against the lower part of the uterus, between the pubes and os internum; and being pushed upwards towards the fundus, sinks down again by its own gravity. All these difficulties are more plain and certain, the nearer the patient approaches to the time of delivery.

Sometimes, the head is not felt till the eighth or ninth month; and in some few cases, not till after the membranes are broke, when it is forced down by the contraction of the uterus, and strong labour-pains. This circumstance may be owing to the head's resting above the basin, especially in a narrow pelvis; or to the diffusion of its belly with air after death, by which the fetus being rendered specifically lighter than the surrounding waters, the body floats up to the fundus, if there is a large quantity of fluid in the membranes; nor is the body always felt when the child lies across the uterus.

How to distinguish the false labour from the true, and the means to be used on that occasion.

If the os uteri remains close shut, it may be taken for granted that the woman is not yet in labour, notwithstanding the pains she may suffer: with regard to which, an accurate inquiry is to be made; and if her complaints proceed from an over stretching fullness of the uterus or vessels belonging to the neighbouring parts, bleeding in the arm or ankle, to the quantity of six or eight ounces, ought to be prescribed, and repeated occasionally. If the pains are occasioned by a looseness or diarrhea, it must be immediately restrained with opiates. Cholic pains are distinguished from those of labour, by being chiefly confined to the belly, without going off and returning by distinct intervals; they are for the most part produced by feces too long retained in the colon, or by such ingesta as occasion a rarefaction or expansion of air in the intestines; by which they are violently stretched and vellicated. This complaint must be removed by opening the bowels, to empty the guts of their noxious contents; and this evacuation being performed, opiates may be administered to allay the pains; either by being injected by the anus, taken by the mouth, or applied externally in form of pithem or embrocation.

Sometimes, the os internum may be a little dilated, and yet it may be difficult to judge whether or not the patient be in labour; the case, however, may be ascertained, after some attendance, by these considerations: if the woman is not arrived at her full time; if no soft or glary mucus hath been discharged from the vagina; if the pains are limited to the region of the belly, without extending to the back and sides of the thighs; if they are slight, and continue without intermission or increase; if, nay, if they have long intervals, and recur without force sufficient to push down the waters and membranes, or child's head, to open the os internum; if this part be felt thick and rigid, instead of being soft, thin, and yielding; we may safely pronounce, that labour is not yet begun; and those alarms are to be removed as we have directed in the case of false or cholick pains. Besides, if the pulse be quick and strong, and the patient attacked by fitches in the sides, back, or head, blooding will be likewise necessary. See Plate CXI, fig. 4.

The division of Labours.

A natural labour is when the head presents, and the woman is delivered by her pains and the assistance commonly given: but, should the case be tedious and lingering, that we are obliged to use extraordinary force, in stretching the parts, extracting with the forceps, or (to save the mother's life) in opening the head and delivering with the crotchit, it is distinguished by the appellation of laborious: and the pretternatural comprehends all those cases in which the child is brought by the feet, or the body delivered before the head. Neither do we mind how the child presents, so much as the way in which it is delivered: for there are cases in which the head presents, and for several hours we expect the child will be delivered in the natural way; but if the woman has not strength enough to force down the child's head into the pelvis, or in floodings, we are at length obliged to turn and bring it by the feet, because it is so high that the forceps cannot be applied; and if the child is not large, nor the pelvis narrow, it were pity to destroy the hopes of the parents, by opening the skull and extracting with the crotchit. In this case, therefore, although the child presents in a natural way, we are obliged to turn and deliver it in the same manner as if the shoulder, breast, or back, had presented; and generally, this operation is more difficult than in either of those cases, because, if the waters are all discharged, and the uterus close contracted round the fetus, it is more difficult to raise the head to the fundus. When the breech presents, we are frequently
ly obliged to push it up, and search for the leg; which
being found, we proceed to deliver the body, and lastly
the head. If the head is large, or the pelvis narrow, and
the waters not discharged, we ought, if possible, to turn
the child into the natural position.

For a further illustration, and to inform young prac-
titioners that difficult cases do not frequently occur, sup-
pose, of three thousand women in one town or village,
one thousand shall be delivered in the space of one year,
and in nine hundred and ninety of these births, the child
shall be born without any other than common assistance:
fifty children of this number shall offer with the fore-
head turned to one side, at the lower part of the pelvis,
where it will flop for some time; ten shall come with
the forehead towards the groin, or middle of the pubes
five shall present with the breech; two or three with the
face, and one or two with the ear; yet, all these shall
be safely delivered, and the calf be more or less lingering
and laborious, according to the size of the pelvis and child,
or strength of the woman of the remaining ten that
make up the thousand, shall present with the head
differently turned and two with the breech; and these
cannot be faced without stretching the parts, using the
forceps or crotchets, or pulling up the child in order to
bring it by the feet; this necessity proceeding either from
the weakness of the woman, the rigidity of the parts, a
narrow pelvis, or a large child, etc. the other two should
lie acrogs, and neither head nor breech, but some other
part of the body, present, so that the child must be turned
and delivered by the feet. Next year, let us suppose
another thousand women delivered in the same place; not
above three, six, or eight, shall want extraordinary as-
sistance; nay, sometimes, though seldom, when the child
is young, or unusually small, and the mother has strong
pains and a large pelvis, it shall be delivered even in the
very worst position, without any other help than that of
the labour-pains.

As the head, therefore, presents right in nine hundred
and twenty of a thousand labours, all such are to be ac-
counted natural; those of the other seventy, that require
assistance, may be deemed laborious; and the other ten
to be denominated laborious or preternatural, as they are
delivered by the head or feet.

In order, therefore, to render this treatise as distinct as
possible, for the sake of the reader’s memory, as well as
of the dependance and connection of the different labours,
they are divided in the following manner: that is ac-
counted natural, in which the head presents, and the
woman is delivered without extraordinary help; those
births are called laborious or nonnatural, when the head
comes along with difficulty, and must be assisted either
with the hand in opening the parts, or with the filet or
forceps, or even when there is a necessity for opening and
extracting it with the crotchets; and those in which the
child is brought by the breech or feet, are denominated
preternatural, because the delivery is performed in a pre-
ternatural way.

Of the different positions of women in labour.

In almost all countries, the woman is allowed either
to sit, walk about, or rest upon a bed, until the os uteri
is pretty much dilated by the gravitation of the waters,
or (when they are in small quantity) by the head of the
foetus, so that delivery is soon expected; when the is put
into such position as is judged more safe, easy, and conve-
nient for that purpose: but the patient may be put upon
labour too prematurely, and bad consequences will attend
such mistakes.

Among the Egyptians, Greeks, and Romans, the
woman was placed upon an high stool; in Germany and
Holland they use the chair which is described by Deventer
and Heister; and for hot climates the stool is perfectly
well adapted; in northern countries, and cold weather,
such a position must endanger the patient’s health.

In the West Indies, and some parts of Britain, the
woman is seated on a stool made in form of a semicircle:
in other places she is placed on a woman’s lap; and some,
kneeling on a large cushion, are delivered backwards.

In France the position is chiefly that of half sitting
and half lying, on the side or end of a bed; or the woman
being in naked bed, is raised up with pillows or a bed-
chair.

The London method is very convenient in natural and
easy labours; the patient lies in bed upon one side, the
knees being contracted to the belly, and a pillow put
between them to keep them asunder. But the most com-
mofions method is to prepare a bed and a couch in the
same room; a piece of oiled cloth or dressed sheep skin
is laid across the middle of each; over the under-sheet, and
above this, are spread several folds of linen, pinned or tied
with tape to each side of the bed and couch; these are
designed to frap up the moisture in time of labour and af-
ter delivery, while the oiled cloths or sheep skins below
preserve the feather bed from being wetted or spoiled:
for this purpose, some people lay besides upon the bed
several under-sheets over one another, so that by sliding
out the uppermost every day, they can keep the bed dry
and comfortable.

The couch must be no more than three feet wide, and
provided with castors; and the woman without any other
dress than that of a short or half shift, a linen skirt or pet-
ticoat open before, and a bed-gown, ought to lie down
upon it, and be covered with cloaths according to the fea-
on of the year. She is commonly laid on the left side,
but in that particular she is to consult her own ease; and
a large sheet being doubled four times or more, one end
must be flapt in below her breech, while the other hangs
over the side of the couch, to be spread upon the knee of
of the accoucheur or midwife, who sits behind her on a
low seat. As soon as she is delivered, this sheet must be
removed, a soft warm cloth applied to the os externum,
and the pillow taken from betwixt her knees; the theft
must be shifted with a clean, warm, half shift, linen skirt,
and bed-gown, and her belly kept firm with the broad
head-band of the filet, the ends of which are to be pin-
and tied together in the form of a bow. These measures being
taken, the couch must be run close to the bed side, and the patient
gently moved from one to another; but, if there is no
room, the bed must be furnished with the same apparatus.
Some, again, are laid across the foot of the bed, to the
head of which the cloaths are previously turned up till after
delivery, when the woman’s posture is adapted, and then

they are rolled down again to cover and keep her warm; by this expidient, the place of a couch is supplied, and the upper part of the bed preferred soft and clean; whereas those who are laid above the cloaths must be taken up and shifted while the bed is put to rights; in which case, they are subject to fainting; and to such as are very much enfeebled, this fatigue is often fatal.

Women are most easily touched, least fatigued, and kept warmest, when they lie on one side: but if the labour should prove tedious, the Parifian method seems most eligible; because when the patient half lies, half sits, the brim of the pelvis is horizontal, a perpendicular line falling from the middle space between the iliacus cords and navel, would pass exactly through the middle of the basin. In this position, therefore, the weight of the waters, and, after the membranes are broke, of the child's head, will gravitate downwards, and affist in opening the parts; while the contracting force of the abdominal muscles and uterus, is more free, strong, and equal in this than in any other attitude. Wherefore, in all natural cafes, when the labour is lingering or tedious, this or any other position, such as standing or kneeling, ought to be tried, which by an additional force, may help to push along the head, and alter its direction when it does not advance in the right way. Nevertheless, the patient must by no means be too much fatigued.

When the woman lies on the left side, the right hand must be used in touching, and vice versa, unless she is laid across the bed; in which case, either hand will equally answer the same purpose: but, if she lies athwart, with the breech towards the bed's foot, it will be most convenient to touch with the left hand when she is upon the left side, and with the right when in the opposite position. And here it will not be amiss to observe, that in the description of all the laborious and preternatural deliveries treated of in this performance, the reader must suppose the woman lying on her back, except when another posture is prescribed; and that in natural and laborious labours, whether she be upon her side or back, the head and shoulders are a little raised into a reclining posture, so that, if she may breathe easily, and assist the pains.

But in preternatural labours, when there is a necessity for using great force in turning the child, the head and shoulders must lie lower than the breech, which being close to the side or foot of the bed, ought to be raised higher than either, because when the pelvis is in this situation, the hand and arm are easily pushed up in a right line, along the back part of the uterus, even to its fundus. Sometimes, however, when the feet of the child are towards the belly of the mother, they are more easily felt and managed when she lies on her side. At other times, placing the woman on her knees and elbows on a low couch, according to Daventer's method, will succeed better, by diminishing in part the strong resistance from the pressure and weight of the uterus and child, by which the feet will sometimes be easier found and delivered; but then it is safer for the child, and easier to the operator and mother, to turn her to her back before you deliver the body and head.

Of the management of women in a Natural Labour.

In a woman come to full time, labour commonly begins and proceeds in the following manner.

The os uteri is felt soft, and a little opened; the circumference being sometimes thick, but chiefly thin: from this aperture is discharged a thick mucus, which lubricates the parts, and prepares them for stretching. This discharge usually begins some days before, and is accounted the forerunner of real labour; at the same time, the woman is seized at intervals with slight pains that gradually stretch the os uteri, fitting it for a larger dilatation; and when labour actually begins, the pains become more frequent, strong, and lasting.

At every pain, the uterus is strongly compressed by the same effort which expels the contents of the rectum at stool, namely the inflation of the lungs, and the contraction of the abdominal muscles.

If the child be surrounded with a large quantity of waters, (see Plate CXI. fig. 4. and 6.) the uterus cannot come in contact with the body of it, but at every pain the membranes are pushed down by the fluid they contain, and the mouth of the womb being sufficiently opened by this gradual and repeated dilatation, they are forced into the middle of the vagina; then the uterus contracts and comes in contact with the body of the child, and, if it be small, the head is propelled with the waters. Here the membranes usually break; but, if that is not the case, they are pushed along towards the os externum, which they also gradually open, and appear on the outside, in the form of a large round bag. Mean while, the head advances, and the os externum being by this time fully dilated, is also protruded; when, if the membranes, instead of burbling in the middle of the pouting, are torn all round at the os externum, the child's head is covered with some part of them, which goes under the name of the caul, or king's hood. If the placenta is, at the same time, separated from the uterus, and the membranes remain unbroken, the fecondaries, waters, and child, are delivered together; but, if the placenta adheres, they must of course give way: and should they be tore all around from the placenta, the greatest part of the body as well as the head of the child will be enveloped by them, from which it must be immediately disengaged, that the air may have a free passage into the lungs.

When the head is large, so that it does not descend immediately into the pelvis, the membranes are forced down by themselves; and being stretched thinner and thinner, give way; when all the waters which are farther advanced than the head, run out; then the uterus coming in contact with the body of the child, the head is squeezed down into the mouth of the womb, which it plucks up so as to detain the rest of the waters. See Plate CXI. fig. 6.

Sometimes, when the quantity of waters is very small, and the uterus embraces the body of the child, the head, covered with the membranes, is forced downwards, and gradually opens the os internum; but, at its arrival in the middle of the pelvis and vagina, part of the waters will be pushed down before it; sometimes in a large, and sometimes in a small proportion, towards the back part of the pelvis. At other times, when the waters are in small quantity, no part of them are to be distinguished farther than the head, which descending lower and lower, the attenuated membranes are split upon it; while, at the same time, it fills up the mouth of the womb and upper
The sagittal future, and the bones are a little separated of the pelvis: this is the place where the coronal crosses the sagittal future, and the bones are a little separated from each other, yielding a softness to the touch, by which may be distinguished four futures, or rather one crossing another. These may be plainly perceived, even before the membranes are broke; yet the examination must not be made during a pain, when the membranes are stretched down and filled with waters; but only when the pain begins to remit, and the membranes to be relaxed; otherwise they may be broke too soon, before the os internum be sufficiently dilated, and the head properly advanced.

When the vertex is come lower down, the sagittal future only is to be felt; because, as the hindhead descends in the pelvis, the fontanelle is turned more backwards, to the side, or towards the concavity of the sacrum: but, after it has arrived below the under part of the os pubis, the lambdoidal may be felt crossing the end of the sagittal future, the occiput making a more obtuse angle than that of the parietal bones, at the place where the three are joined together. But all these circumstances are more easily distinguished after the membranes are broke, or when the head is so compressed that the bones ride over one another, provided the hairy scalp be not excessively swelled. See Plate CXI. fig. 7.—See also Plate CXII. fig. 2, which shews in what manner the head of the foetus is helped along with the forceps, as artificial hands, when it is necessary for the safety of either mother or child.

AABC, The vertebrae of the loins, os sacrum, and coccyx.

D, The os pubis of the left side.

E, The insterum retiurnum.

GGG, The uterus.

H, The mons veneris.

I, The clitoris, with the left nympha.

H, The corpus cavernosum clitoridis.

V, The meatus urinarius.

K, The left labium pudendi.

L, The anus.

N, The perineum.

QP, The left hip and thigh.

R, The skin and muscular parts of the loins.

How and when to break the Membranes.

If the child be surrounded with a large quantity of waters, the uterus cannot come in contact with the body so as to press down the head, until the membranes are pushed a considerable way before it into the vagina; nor even then, until they are broke, and the fluid diminished in such a manner as will allow the womb to contract, and with the assistance of the pains, force along the child. When the membranes therefore are strong or unadvanced, and continue so long unbrooke that the delivery is retarded, provided the os internum be sufficiently dilated, they ought to be broke without further delay; especially if the woman hath been much fatigued or exhausted with labour, or is seized with a violent flooding: in which case, the rupture of the membranes hastens delivery, and the hemorrhage is diminished by the contraction of the uterus, which

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which lessens the mouths of the vessels that are also compressed by the body of the child.

The common method of breaking the membranes is by thrusting the finger against them when they are protruded with the waters during the pain, or by pinching them with the finger and thumb; but if they are detained too high to be managed in either of these methods, the hand may be introduced into the vagina, if the os externum is so lax as to admit it easily: and if this cannot be done without giving much pain, the fore and middle fingers being pushed into the vagina with the other hand, let a probe or pair of pointed scissors be directed along and between them, and thrust through the membranes, when they are pushed with the waters below the head. This operation must be cautiously performed, lest the head should be wounded in the attempt; and as for the membranes, let the opening be never so small, the waters are discharged with force sufficient to tear them asunder.

If the vertex, instead of resting at the side of the brim of the pelvis, or at the os pubis, is forced further down to the os internum, and the waters happen to be in small quantity, the head is pushed forwards, and gradually opens the mouth of the womb without any sensible interruption of the waters: then it advances by degrees into the vagina, and the membranes being split or tore, little or nothing is discharged until the body of the child is delivered: and in this case, the hair of the head being plainly felt, will be a sufficient indication that the membranes are broke. If no hair is to be felt, but a smooth body presents itself to the touch; and the woman has undergone many strong pains, even after the mouth of the womb hath been largely dilated, and the head forced into the middle of the pelvis; you may conclude, that delivery is retarded by the rigidity of the membranes; that there is but a small quantity of waters; and that, if the containing sacs were broke, the head would come along without further hesitation.

Sometimes, no waters can be felt while the head is no farther advanced than the upper part of the pelvis, because it plugs up the passage and keeps them from descending; but, as it advances downwards, the uterus contracts, and they are forced down in a small quantity towards the back part: from thence, as the head descends, or even though it should flick in that situation, they are pushed farther down, and the membranes may be easily broke; but the task is more difficult when no waters come down, and the membranes are contiguous to the head. In this case, they must be scratched a little during every pain, with the nail of a finger, which, though short and smooth, will, by degrees, wear them thinner and thinner, until they split upon the head by the force of labour. Yet this expedient ought never to be used until you are certain that delivery is retarded by their rigidity; for, if that be not the hindrance, the difficulty must proceed from the weakness of the woman, a large head, or narrow pelvis: in which case, the delivery is a work of time, and will be obstructed by the premature discharge of the waters, which by gradually passing by the head, ought to keep the parts moist and slippery, in order to facilitate the birth: for when the membranes are not broke until the head is forced into the middle of the pelvis, the largest part of it being then past the upper part of the sacrum, is commonly squeezed along, opens the os externum, and is delivered before all the waters are discharged from the uterus; so that what remains, by moistening and lubricating the parts, help the shoulders and body to pass with more ease. When the membranes are too soon broke, the under part of the uterus contracts sometimes so strongly before the shoulders, that it makes the resistance still greater.

In most natural labours, the space between the fore and back fontanelles, viz. the vertex, presents to the os internum, and the forehead is turned to the side of the pelvis, because the basin at the brim is widest from side to side; and frequently, before the head is pushed in and fast wedged among the bones, the child (after a pain) is felt to move and turn it to that side or situation in which it is least pressed and hurt, if it was not presenting in that position before: but this position of the head may alter, viz. in those where it is as wide, or wider, from the back part to the fore part of the brim, than from side to side, the forehead may be turned backwards or forwards. But this form of the pelvis seldom happens.

This posture is always observed in a narrow pelvis, when the upper part of the sacrum juts forward to the pubes; but, as the child is forced lower down, the forehead turns into the hollow at the inferior part of the sacrum, because the vertex and occiput find less resistance at the lower part of the os pubis than at the ifchium, to which it was before turned; the pelvis being at the pubes, as formerly described, no more than two inches in depth, whereas at the ifchium it amounts to four. If, therefore, the forehead sticks in its former situation, without turning into the hollow, it may be assisted by introducing some fingers, or the whole hand, into the vagina, during a pain, and moving it in the right position.

When the head of the fetus presents, and is forced along in any of those positions, the labour is accounted natural; and little else is to be done, but to encourage the woman to bear down with all her strength in every pain, and to rest quietly during each interval: if the parts are rigid, dry, or inflamed, they ought to be lubricated with pomatum, hog’s lard, butter, or ung. alb.: the two first are most proper for the external parts; and the the two last (as being harder and not so easily melted) ought to be put up into the vagina, to lubricate that and the os internum.

The mouth of the womb and os externum, for the most part, open with greater difficulty in the first than in the succeeding labours, more especially in women turned of thirty. In these cases, the os externum must be gradually dilated in every pain, by introducing the fingers in form of a cone, and turning them round, so as to stretch the parts by gentle degrees; and the whole hand being admitted into the vagina, it will be sometimes found necessary to insinuate the fingers with the flat of the hand between the head and os internum: for, when this precaution is not taken in time, the os uteri is frequently pushed before the head (especially that part of it next the pubes) even through the os externum; or if the head passes the mouth of the womb, it will protrude the parts at the os externum, and will endanger a laceration in the perineum.
perineum. This dilatation, however, ought to be cautiously performed, and never attempted except when it is absolutely necessary; even then it must be effected slowly, and in time of a pain, when the woman is least sensible of the dilating force.

When the labour happens to be lingering, though every thing be in a right posture, if the aidants be clamorous, and the woman herself too anxious and impatient to wait the requisite time without complaining, the labour will be actually retarded by her uneasiness, which we must endeavour to surmount by arguments and gentle persuasion; but if she is not to be satisfied, and strongly impressed with an opinion that certain medicines might be administered to hasten delivery, it will be convenient to prescribe some innocuous medicine, that the may take between whiles, to beguile the time and please her immanation: but, if she is actually weak and exhausted, it will be necessary to order something that will quicken the circulating fluids, such as preparations of anlber, caflor, myrrh, volatile spirits, the pulv. myrrh. composit. of the London, or pulv. ad partum of the Edinburgh Pharmacopoeia, with every thing in point of diet and drink that nourishes and strengthens the body. If the patient is of a plethoric habit, with a quick strong pulse, the contrary method is to be used, such as yamfection, antiphlogistic medicines, and plentiful draughts of weak diluting fluids.

How to behave when the birth is obstructed by the navel-string or shoulders of the child, or a narrow pelvis.

Although the head is pushed down into the pelvis, and the vertex employed in opening the os externum, the forehead being lodged in the concavity formed by the coccyx and lower part of the sacrum; yet frequently after the labour-pain is abated, the head gets is withdrawn by the navel-string happening to be twilled round the neck; or when the shoulders, instead of advancing, are retarded at the brim of the pelvis, one refting over the offa pubis, while the other is fixed at the sacrum; or when (the waters having been long evacuated) the under-part of the uterus contracts round the neck and before the shoulders, keeping up the body of the child.

When the head is therefore drawn back by any of these obstacles, and the delivery hath been retarded during several pains, one or two fingers being introduced into the rectum before the pain goes off, ought to press upon the forehead of the child at the root of the nose, great care should be taken to avoid the eyes: this pressure detains the head till the return of another pain, which will squeeze it farther down, while the fingers pushing slowly and gradually, turn the forehead half round forwards and half round upwards. By this assistance, and the help of strong pains, the child will be forced along, although the neck be entangled in the navel-string; for, as the child advances, the uterus contracts, and consequently the placenta is moved lower: the funis umbilicus will also fretch a little, without obstructing the circulation.

The head being thus kept down, the shoulders too are pressed in every suceeding pain until they are forced into the pelvis, when the whole comes along without further difficulty. And this expedient will, moreover, an-
The child being born, the funis umbilicalis must be divided, and the placenta delivered, according to the directions that will occur in the sequel.

How to manage the Child after Delivery.

The child being delivered, ought to be kept warm beneath the beds-cloaths, or immediately covered with a warmed flannel or linen cloth; if it cries and breathes, the umbilical cord may be tied and cut, and the child delivered to the nurse without delay; but, if the air does not immediately rush into the lungs, and the circulation continues between it and the placenta, the operation of tying and cutting must be delayed, and every thing tried to stimulate, and sometimes to give pain. If the circulation is languid, respiration begins with difficulty, and proceeds with long intervals; and if it be entirely stopped in the funis; the child, if alive, is not easily recovered; sometimes, a great many minutes are elapsed before it begins to breathe. Whatever augments the circulating force, promotes respiration; and as this increases, the circulation grows stronger, so that they mutually afflict each other. In order to promote the one and the other, the child is kept warm, moved, shaken, whipt; the head, temples, and breast rubbed with spirits, garlic, onion, or mustard applied to the mouth and nose; and the child has been sometimes recovered by blowing into the mouth with a silver canula, so as to expand the lungs.

When the placenta is itself delivered, immediately or soon after the child, by the continuance of the labours, or hath been extricated by the operator, that the uterus may contract, so as to restrain too great a flooding; in this case, if the child has not yet breathed, and a pulsation is felt in the ves sels, some people (with good reason) order the placenta, and as much as possible of the navel-string, to be thrown into a basin of warm wine or water, in order to promote the circulation between them and the child; others advise us to lay the placenta on the child’s belly, covered with a warm cloth; and a third fet order it to be thrown upon hot ashes: but, of these, the warm water seems the most innocent and effectual expedient. Nevertheless, if the placenta is still retained in the uterus, and no dangerous flooding ensues, it cannot be in a place of more equal warmth, while the operator endeavours, by the methods above described, to bring the child to life.

In lingering labours, when the head of the child hath been long lodged in the pelvis, so that the bones ride over one another, and the shape is preternaturally lengthened, the brain is frequently so much compressed, that violent convulsions ensue before or soon after the delivery, to the danger and oft-times the destruction of the child. This disorder is frequently relieved and carried off, and the bad consequences of the long compression prevented, by cutting the navel-string before the ligature is made, or tying it so lightly as to allow two, three, or four large spoonfuls to be discharged.

If the child has been dead one or two days before delivery, the lips and genitals (especially the forcaum in boys) are of a livid hue; if it hath lain dead in the uterus two or three days longer, the skin may be easily stripped from every part of the body, and the navel-strings appears of the same colour with the lips and genitals; in ten or fourteen days, the body is much more livid and mortified, and the hairy scalp may be seared with ease; and indeed, any part of the child which hath been strongly pressed into the pelvis, and retained in that situation for any length of time, will adopt the same mortified appearance.

How to tie the Funis Umbilicalis.

Different practitioners have used different methods of performing this operation; some proposing to tie and separate the funis before the placenta is delivered; to apply one ligature close to the belly of the child, with a view to prevent a rupture of the navel; and making another two inches above the former, to divide the rope between the two tyings: by the second ligature, they mean to prevent a dangerous hemorrhage from the woman, provided the placenta adheres to the uterus. But all these precautions are founded upon mistaken notions, and the following seems to be that which is safest and best: if the placenta is not immediately delivered by the pains, and no flooding obliges you to hasten the extraction, the woman may be allowed to rest a little, and the child to recover; if it does not breathe, or the respiration is weak, let the methods above prescribed be put in practice, with a view to stimulate the circulation; but if the child is lively, and cries with vigour, the funis may be immediately tied in this manner: having provided a ligature or two, composed of sandy threads waxed together, so as to equal the diameter of a pack-thread, being seven inches in length, and knotted at each end, tie the navel-string about two fingers breadth from the belly of the child, by making at first one turn, if the funis be small, and securing it with two knots; but if the cord be thick, make two more turns, and another double knot; then cut the funis with a pair of sharp scissors one finger’s breadth from the ligature towards the placenta; and in cutting run the scissors as near as possible to the root of the blades, else the funis will be apt to slip from the edge, and you will be obliged to make several snips before you can effect a separation: at the same time, guard the points of the scissors with your other hand. The child being washed, a linen rag is wrapped round the tied funis; which being doubled up along the belly, a square compress is laid over it, and kept firm or moderately tight with what the nurses call a belly-band, or roller round the body.

This portion of the funis soon shrinks, turns frizz livid, then black, and about the fifth day falls off close to the belly; and let the navel-string be tied in any part, or at any distance whatsoever from the belly, it will always drop off at the same place: so that ruptures in the navel seldom or never depend upon the tying of the funis, but may happen when the compress and belly band are not kept sufficiently firm, and continued some time after the separation of the withered portion, especially in those children that cry much: the bandage ought always to be applied so firmly as not to affect respiration.

The ligature upon the funis must always be drawn so tight as to shut up the mouths of the vessels: therefore, if they continue to pour out their contents, another ligature must be applied below the former; for if this precaution...
Of delivering the Placenta.

The funis being separated, and the child committed to the nurse, the next care is to deliver the placenta and membranes, if they are not already forced down by the labour-pains. We have already observed, that if there is no danger from a flooding, the woman may be allowed to rest a little, in order to recover from the fatigue she has undergone; and that the uterus may, in contracting, have time to squeeze and separate the placenta from its inner surface: during which pause also, about one, two or three tea-cups full of blood is discharged through the funis, from the vessels of the placenta, which is thus diminished in bulk, so that the womb may be the more contracted; and this is the reason for applying one ligature only upon the cord. In order to deliver the placenta, take hold of the navel-string with the left hand, turning it round the fore and middle fingers, or wrapping it in a cloth, that it may not slip from your grasp; then pull gently from side to side, and direct the woman to assist your endeavour, by straining as if your knees were at stool, blowing forcibly into her hand, or provoking herself to reach by thrusting her finger into her throat. If by these methods the placenta cannot be brought away, introduce your hand slowly into the vagina, and feel for the edge of the cake, which when you have found, pull it gradually along; as it comes out at the os externum, take hold of it with both hands and deliver it, bringing away, at the same time, all the membranes, which, if they adhere, must be pulled along with leisure and caution.

When the funis takes its origin towards the edge of the placenta, which is frequently the case, the cake comes easier off by pulling, than when the navel-string is inserted in the middle, unless it be uncommonly retained by its adhesion to the womb, or by the strong contraction of the os internum. If the funis is attached to the middle of the placenta, and that part presents to the os internum or externum, the whole mass will be too bulky to come along in that position: in this case you must introduce two fingers within the os externum, and bring it down with its edge foremost.

When the placenta is separated by the contraction of the uterus, in consequence of its weight and bulk, it is pulled down before the membranes, and both are brought away inverted.

When part of the placenta hath passed the os internum, and the rest of it cannot be brought along by easy pulling, because the os uteri is close contracted round the middle of it, or part of it still adheres to the womb, slide the flat of your hand below the placenta through the os internum; and having dilated the uterus, slip down your hand to the edge of the cake, and bring it along: but, if it adheres to the uterus, pull up your hand agio, and having separated it cautiously, deliver it as before.

If, instead of finding the edge or middle of the placenta, presenting to the os externum or internum, you feel the mouth of the womb closely contracted, you must take hold of the navel-string as above directed, and slide your other hand along the funis into the vagina; then slowly push your fingers and thumb, joined in form of a cone, through the os uteri, along the same cord, to the place of its insertion in the placenta: here let your hand rest, and feel with your fingers to what part of the uterus the cake adheres: if it be loose at the lower edge, try to bring it along; but if it adheres, begin and separate it slowly, the back of your hand being turned to the uterus, and the fore part of your fingers towards the placenta: and for this operation the nails ought to be cut short and smooth. In separating, press the ends of your fingers more against the placenta than the uterus; and if you cannot distinguish which is which, because both feel soft (though the uterus is firmer than the placenta, and this last more solid than coagulated blood,) in this case, slide down your fingers to its edge, and conduct them by the separated part, pressing it gently from the uterus, until the whole is disengaged. Sometimes, when part of it is separated, the rest will loosen and come along, if you pull gently at the detached portion; but, if this is not effected with ease, let the whole of it be separated in the most cautious manner: sometimes, also, by grasping the inside of the placenta with your hand, the whole will be loosened without further trouble. As the placenta comes along, slide down your hand and take hold of the lower edge, by which it must be extracted, because it is too bulky to be brought away altogether in a heap; and let it be delivered as whole as possible, keeping your thumb or fingers fixed upon the navel-string, by which means laceration is often prevented.

When the woman lies on her back, and the placenta adheres to the left side of the uterus, it will be most commodious to separate the cake with the right hand; whereas the left hand is most conveniently used when the placenta adheres to the right side of the womb; but when it is attached to the forepart, back, or fundus, either hand will answer the purpose.

That part of the uterus to which the placenta adheres, is kept still dilated, while all the rest of it is contracted.

The nearer the adhesion is to the os internum, the easier is the placenta separated, and vice versa: because it is difficult to reach up to the fundus, on account of the contraction of the os internum, and lower part of the womb, which are not stretched again without great force after they have been contracted for any length of time.

When therefore the placenta adheres to the fundus, and all the lower part of the womb is strongly contracted, the hand must be forced up in form of a cone into the vagina, and then gradually dilate the os internum and inferior part of the uterus. If great force is required, exert it slowly, resting between whiles, that the hand may not be
be cramped, nor the vagina in danger of being tore from the womb; for in this case, the vagina will lengthen considerably upwards.

While you are thus employed, let an assitant press with both hands on the woman's belly; or while you push with one hand, press with the other, in order to keep down the uterus, else it will rise high up, and roll about like a large ball, below the lax perties of the abdomen, so as to hinder you from effecting the necessary dilatation.

When you have overcome this contraction, and introduced your hand into the fundus, separate and bring the placenta along, as above directed; and should the uterus be contracted in the middle like a hour-glass, a circumstance that sometimes, though rarely happens, the same method must be practised.

In every case, and especially when the placenta hath been delivered with difficulty, introduce your your hand after its extraction, in order to examine if any part of the uterus be pulled down and inverted; and if that be the case, push it up and reduce it without los of time; then clear it of the coagulated blood, which otherwise may occasion violent after-pains.

For the most part, in ten, fifteen, or twenty minutes, more or less, the placenta will come away of itself; and though some portion of it, or of the membranes, be left in the uterus, provided no great flooding ensues, it is commonly discharged in a day or two, without any detriment to the woman: but at any rate, if possible, all the fecundines ought to be extracted at once, and before you leave your patient, in order to avoid reflections.

**OF LABORIOUS LABOURS.**

**How LABORIOUS LABOURS are occasioned.**

All those cases in which the head presents, and cannot be delivered in the natural way, are accounted more or less laborious, according to the different circumstances from which the difficulty arises; and these commonly are, first, Great weakens, proceeding from loss of appetite and bad digestion; frequent vomitings, diarrhées, or dyfenteries, flooding, or any other disease that may exhaust the patient; as also the fatigue she may have undergone by unskilful treatment in the beginning of labour.

Secondly, From excessive grief and anxiety of mind, occasioned by the unfeaneful news of sudden misfortune in time of labour; which often affect her so, as to carry off the pains, and endanger her sinking under the shock.

Thirdly, From the rigidity of the os uteri, vagina, and external parts, which commonly happens to women in the first birth, especially to those who are about the age of forty: though it may be also owing to large calolities, produced from laceration or ulceration of the parts; or to glands and scirrous tumours that block up the vagina.

Fourthly, When the under-part of the uterus is contracted before the shoulders, or the body entangled in the navel-string.

Fifthly, From the wrong presentation of the child's head; that is, when the forehead is towards the groin or middle of the os pubis; when the face presents with the chin to the os pubis, internum, or sacrum; when the crown of the head rolls above the os pubis, and the forehead or face is pressed into the hollow of the sacrum; and lastly, when one of the ears presents.

Sixthly, From the extraordinary ossification of the child's head; by which the bones of the skull are hindered from yielding, as they are forced into the pelvis; and form a hydrocephalus or dropsy, distending the head to such a degree, that it cannot pass along until the water is discharged.

Seventhly, From a too small or distorted pelvis, which often occurs in very little women, or such as have been rickety in their childhood. See Plate CXII. fig. 6. 7.

In all these cases, except when the pelvis is too narrow and the head too large, provided the head lies at the upper-part of the brim, or (though pressed into the pelvis) can be easily pushed back into the uterus, the best method is, to turn the child and deliver by the feet; but, if the head is pressed into the middle or lower part of the pelvis, and the uterus strongly contracted round the child, delivery ought to be performed with the forceps; and in all the seven cases, if the woman is in danger, and if you can neither turn, nor deliver with the forceps, the head must be opened and delivered with crotchets. Laborious cases, from some of the above recited causes, happen much oftener than those we call preternatural; but, those which proceed from a narrow pelvis, or a large head, are of the worst consequence. These cases demand greater judgment in the operator than those in which the child's head does not present; because in these last we know, that the best and safest method is to deliver by the feet; whereas in laborious births, we must maturely consider the cause that retards the head from coming along, together with the necessary assistance required; we must determine when we ought to wait patiently for the efforts of nature, and when it is absolutely necessary to come to her aid. If we attempt to succour her too soon, and use much force in the operation, so that the child and mother, or one of the two, are lost, we will be apt to reproach ourselves for having acted prematurely; upon the supposition, that if we had waited a little longer, the pains might have, by degrees, delivered the child; or at least, forced the head fo low, as that we might have extracted it with more safety, by the assistance of the forceps. On the other hand, when we leave it to nature, perhaps by the strong pressire upon the head and brain, the child is dead when delivered, and the woman so exhausted with tedious labour, that her life is in imminent danger: in this case, we blame ourselves for delaying our help too long, reflecting that bad we delivered the patient sooner, without paying such ferupulous regard to the life of the child, the woman might have recovered without having run such a dangerous risk. Doubtless it is our duty to save both mother and child, if possible; but, if that is impracticable, to pay our chief regard to the parent; and in all dubious cases, to act cautiously and circumspectly, to the beft of our judgment and skill.

If the head is advanced into the pelvis, and the uterus strongly contracted round the child, great force is required to pull it back into the womb, because the effort must be sufficient
sufficient to stretch the uterus, so as to re-admit the head, together with your hand and arm; and even then the child will be turned with great difficulty.

Should you turn when the head is too large, you may bring down the body of the child, but the head will stick fast above, and cannot be extracted without the help of forceps or crotchets; (see explanation of Plate CXIII. fig. 5, below:) yet the case is still worse in a narrow pelvis, even though the head be of an ordinary size. When things are so situated, you should not attempt to turn, because if so doing you may give the woman a great deal of pain, and yourself much unnecessary fatigue: you ought therefore to try the forceps, and if they do not succeed, diminish the size of the head, and extract it, as shall be afterwards shown.

Plate CXIII. fig. 5. represents, in a lateral view of the pelvis, the method of extracting, with the assistance of a curved crotchet, the head of the fetus, when left in the uterus, after the body is delivered and separated from it; either by its being too large, or the pelvis too narrow.

ABC, The os facrum and coccyx.
D, The os pelvis of the left side.
EE, The uterus.
F, The locking part of the crotchet.
g.h.i. The point of the crotchet on the inside of the cranium.

Of the Fillets and Forceps.

We have already observed, that the greatest number of difficult and lingering labours proceed from the head's sticking fast in the pelvis, which situation is occasioned by one of the seven causes recited above: when formerly this was the case, the child was generally left, unless it could be turned and delivered by the feet; or if it could be extracted alive, either died soon after delivery, or recovered with great difficulty from the long and severe compression of the head, while the life of the mother was endangered from the same cause as above described: for, the pressure being reciprocal, the fibres and vessels of the soft parts contained in the pelvis are bruised by the child's head, and the circulation of the fluids obstructed; so that a violent inflammation, and sometimes a sudden mortification, ensues. If the child could not be turned, the method practised in these cases, was to open the head and extract with the crotchet; and this expedient produced a general clamour among the women, who observed, that when recourse was had to the assistance of a man-midwife, either the mother or child, or both, were lost. This censure, which could not fail of being a great discouragement to male practitioners, stimulated the ingenuity of several gentlemen of the profession, in order to contrive some gentler method of bringing along the head, so as to save the child, without any prejudice to the mother.

Their endeavours have not been without success: a more safe and certain expedient for this purpose hath been invented, and of late brought to greater perfection in this than in any other kingdom; so that if we are called in before the child is dead, or the parts of the woman in danger of a mortification, both the fetus and mother may frequently be happily saved. This fortunate contrivance is no other than the forceps, which was, as is alluded, first used here by the Chamberlains, by whom it was kept as a secret, and after their decease conveyed imperfectly known, as to be seldom applied with success; so that different practitioners had recourse to different kinds of fillets or crotchets. Blunt hooks also of various make were invented in England, France, and other parts. The forceps, since the time of Dr Chamberlain, have undergone several alterations, particularly in the joining, handles, form, and composition.

The common way of using them formerly, was by introducing each blade at random, taking hold of the head any how, pulling it straight along, and delivering with downright force and violence; by which means, both os internum and externum were often tore, and the child's head much bruised. On account of these bad consequences, they had been altogether disused by many practitioners; some of whom endeavoured, in lieu of them, to introduce divers kinds of fillets over the child's head; but none of them can be so easily used, or have near so many advantages, as the forceps, when rightly applied and conducted.

For my own part, says Dr Smellie, finding in practice that, by the directions of Chapman, Giffard, and Gregoire at Paris, I frequently could not move the head along without contusing it, and tearing the parts of the woman; for they directed us to introduce the blades of the forceps where they will easiest pass, and taking hold of the head in any part of it, to extract with more or less force, according to the resistance; I began to consider the whole in a mechanical view, and reduce the extraction of the child to the rules of moving bodies in different directions: in consequence of this plan, I more accurately surveyed the dimensions and form of the pelvis, together with the figure of the child's head, and the manner in which it passed along in natural labours: and from the knowledge of these things, I not only delivered with greater ease and safety than before, but also had the satisfaction to find in teaching, that I could convey a more distinct idea of the art in this mechanical light than in any other; and particularly, give more precise and solid directions for applying the forceps, even to the conviction of many old practitioners, when they reflected on the uncertainty attending the old method of application. From this knowledge, too, joined with experience, and hints which have occurred and been communicated to me, I have been led to alter the form and dimensions of the forceps, so as to avoid the inconveniences that attended the use of the former kinds. See Plate CXIII. fig. 6.

A, The straight forceps, in the exact proportion as to the width between the blades, and length from the points to the locking part; the first being two and a half inches, and the second six inches; which, with three inches and a half, (the length of the handles), make in all eleven inches and a half.

B represents the posterior part of a single blade, in order to shew the width and length of the open part of the same, and the form and dimensions of the whole.

C, The blunt hook, which is used for three purposes:

To assist the extraction of the head, after the cranium is opened with the scissors, by introducing the
the small end along the ear on the outside of the head to above the under-jaw, where the point is to be fixed; the other extremity of the hook being held with one hand, whilst two fingers of the other are to be introduced into the foresaid opening, by which holds the head is to be gradually extracted.

2. The small end is useful in abortions, in any of the first four or five months, to hook down the second ones, when lying loose in the uterus, when they cannot be extracted by the fingers, or labour-pains, and when the patient is much weakened by bleedings.

3. The large hook at the other end is useful to assist the traction of the body, when the breech presents; but should be used with great caution, to avoid the dislocation or fracture of the thigh.

The lacks or fillets are of different kinds, of which the most simple is a noose made on the end of a fillet or lime garter; but this can only be applied, before the head is fast jammed in the pelvis, or when it can be pushed up and raised above the brim. The os externum and internum having been gradually dilated, this noose must be conveyed on the ends of the fingers, and slipped over the fore and hind head. There are also other kinds differently introduced upon various blunt instruments, too tedious either to describe or use: but the most useful of all these contrivances, is a fillet made in form of a sheath, mounted upon a piece of slender whale bone, about two feet in length, which is easier applied than any other expedient of the same kind. See Plate CXIII. fig. 7.

A represents the whale-bone fillet, which may be sometimes useful in laborious cases, when the operator is not provided with the forceps, in sudden and unexpected exigencies.

BB, Two views of a pessary for the prolabus uteri. After the uterus is reduced, the large end of the pessary is to be introduced into the vagina, and the os uteri retained in the concave part, where there are three holes to prevent the stagnation of any moisture. The small end without the os externum has two tapes drawn through the two holes, which are tied to four other tapes, that hang down from a belt that surrounds the woman's body, and by this means keeps up the pessary. This pessary may be taken out by the patient when she goes to bed, and introduced again in the morning; but as this sometimes rubs the os externum, so as to make its use uneasy, the round kind, marked C, are of more general use. They are made of wood, ivory, or cork, (the last covered with cloth and dipt in wax;) The pessary is to be lubricated with pomatum, the edge forced through the passage into the vagina, and a finger introduced in the hole in the middle lays it across within the os externum. They ought to be larger or smaller, according to the wideness or narrowness of the passage, to prevent their being forced out by any extraordinary straining.

DD gives two views of a female catheter, to shew its degree of curvature and different parts.

When the head is high up in the pelvis, if the woman has been long in labour, and the waters discharged for a considerable time, the uterus being strongly contracted, so as that the head and shoulders cannot be raised, or the child turned to be delivered by the feet, while the mother is enfeebled, and the pains so weak, that, unless assisted, she is in danger of her life: also, when the os internum, vagina, and labia pudendi, are inflamed, and tumefied; or when there is a violent discharge of blood from the uterus, provided the pelvis is not too narrow, nor the head too large, this fillet may be successfully used; in which case, if the os externum and internum are not already sufficiently open, they must be gradually dilated as much as possible, by the hand, which, at the same time must be introduced and passed along the side of the head, in order to ascertain the position thereof. This being known, let the other hand introduce the double of the whale-bone and fillet over the face and chin, where you can have the best purchase, and where it will be least apt to slip and lose its hold. This application being effected, let the hand be brought down, and the whale-bone drawn from the sheath of the fillet, which (after the ends of it are tied together) must be pulled during every pain, pressing at the same time with the other hand, upon the opposite part of the head, and using more or less force according to the resistance.

The disadvantage attending all fillets, is the difficulty in introducing and fixing them; and though this last is easier applied than the others; yet when the vertex presents, the child's chin is so pressed to the breast, that it is often impracticable to intumesc the fillet between them; and if it is fixed upon the face or hind head, it frequently slips off, in pulling: but, granting it commodiously fixed, when the head is large, or the pelvis narrow; so that we are obliged to pull with great force, the fillet will gall, and even cut the soft parts to the very bone; and if the child comes out of a sudden, in consequence of violent pulling, the external parts of the woman are in great danger of sudden laceration: but, if the head is small, and comes along with a moderate force, the child may be delivered by this contrivance, without any bad consequence; though in this case, we find by experience, that unless the woman has some very dangerous symptom, the head will in time slide gradually down into the pelvis, even when it is too large to be extracted with the fillet or forceps, and the child be safely delivered by the labour-pains, although slow and lingering, and the mother seems weak and exhausted, provided the be supported with nourishing and strengthening cordials.

As the head in the 6th and 7th cases is forced along the pelvis, commonly in these laborious cases, the bones of the cranium are so compressed, that they ride over one another, so that the bulk of the whole is diminished, and the head, as it is pushed forward, is, from a round, altered into an oblong figure: when therefore it is advanced into the pelvis, where it flicks fast for a considerable time, and cannot be delivered by the labour-pains, the forceps may be introduced with great ease and safety, like a pair of artificial hands, by which the head is very little (if at all) marked, and the woman very seldom torn. But if the head is detained above the brim of the pelvis, or if a small portion of it only farther advanced, and it appears, that the one being too narrow, or the other too large, the woman cannot be delivered by the strongest labour-pains;
in that case, the child cannot be fixed either by turning and bringing it by the feet, or delivered by the application of fillet or forceps; but the operator must unavoidably use the disagreeable method of extracting with the crotcher. Nevertheless, in all these cases, the forceps ought first to be tried; and sometimes they will succeed beyond expectation, provided the birth is retarded by the weakness of the woman, and the second, third, fourth, or fifth obstructions: but they cannot be depended upon even when the vertex presents, with the forehead to the side or back part of the pelvis, and (though the woman has had strong pains for many hours after the membranes are broke) the head is not forced down into the pelvis, or at least, but an inconsiderable part of it, resembling the small end of a fugar-loaf. For, from these circumstances, you may conclude, that the largest part of it is still above the brim, and that either the head is too large, or the pelvis too narrow. Even in these cases, indeed, the left fillet or a long pair of forceps may take such firm hold, that, with great force and the strong purchase, the head will be delivered: but such violence is commonly fatal to the woman, by causing such an inflammation, and perhaps laceration of the parts, as is attended with mortification.

When the head is high, the forceps may be locked in the middle of the pelvis; but in that case, great care must be taken in feeling with the fingers all round, that no part of the vagina be included in the locking. Sometimes, when the head refts, or is pressed too much on the forepart or side of the pelvis, either at the brim or lower down, by introducing one blade, it may be moved farther down, provided the labour-pains are strong, and the operation assisted by the fingers of the other hand applied to the opposite side of the head; but if the fingers cannot reach high enough, the best method is to turn or move the blade towards the ear of the child, and introduce the other along the opposite side.

General rules for using the Forceps.

The farther the head is advanced in the pelvis, the easier it is delivered with the forceps; because then, if in the 6th or 7th case, it is changed from a round to an oblong figure, by being forced along by the labour-pains; on the contrary, when the head remains high up, retting upon the brim of the pelvis, the forceps are used with greater difficulty and uncertainty.

The os externum must be gradually opened by introducing the fingers one after another, in form of a cone, after they have been lubricated with pomatum, moving and turning them in a semicircular motion, as they are pushed up. If the head is so low down that the hand cannot be introduced high up in this form, let the parts be dilated by the fingers turned in the direction of the coccyx, the back of the hand being upwards, next to the child’s head: the external parts being sufficiently opened to admit all the fingers, let the back of the hand be turned to the perineum, while the fingers and thumb being flattened, will slide along between the head and the os sacrum. If the right hand be used, let it be turned a little to the left side of the pelvis, because the broad ligament and membrane that fill up the space between the sacrum and ischia, will yield and allow more room for the fingers to advance; for the same reason, when the left hand is introduced, it must be turned a little to the right side. Having gained your point so far, continue to pull up, until your fingers pass the os internum; at the same time, with the palm of your hand, raise or scoop up the head; by which means, you will be more at liberty to reach higher, dilate the internal parts, and distinguish the situation and size of the head, together with the dimensions of the pelvis: from which investigation, you will be able to judge, whether the child ought to be turned and brought by the feet, or delivered with the forceps; or, if the labour-pains are strong, and the head presents tolerably fair, without being jammed in the pelvis, you will resolve to wait some time, in hope of seeing the child delivered by the labour-pains, especially when the woman is in no immediate danger, and the chief obstacle is the rigidity of the parts.

The position of the head is distinguished by feeling for one of the ears, the fore or smooth part of which is towards the face of the child; if it cannot be ascertained by this mark, the hand and fingers must be pulled farther up, to feel for the face or back part of the neck; but, if the head cannot be traced, the observation must be taken from the fontanelle, or that part of the cranium where the lambdoidal crosses the end of the sagittal future. When the ears of the child are towards the sides of the pelvis, or diagonal, the forehead being either to the sacrum or pubes, the patient must lie on her back, with her breech a little over the bed. If one ear is to the sacrum, and the other to the pubes, she must be laid on one side, with her breech over the bed, as before, her knees being pulled up to her belly, and a pillow placed between them; except when the upper part of the sacrum juts too much forward; in which case, the must lie upon her back, as above described.

The blades of the forceps ought always, if possible, to be introduced along the ears; by which means, they approach nearer to each other, gain a firmer hold, and hurt the head less than in any other direction; frequently, indeed, not the least mark of their application is to be perceived; whereas, if the blades are applied along the forehead and occiput, they are at a greater distance from each other; require more room, frequently at their points press in the bones of the skull, and endanger a laceration in the os externum of the woman. See Plate CXII. fig. 2.

The woman being laid in a right position for the application of the forceps, the blades ought to be privately conveyed between the feather-bed and the clothes, at a small distance from one another, or on each side of the patient: that this conveyance may be the more easily effected, the legs of the instrument ought to be kept in the operator’s side-pockets. Thus provided, when he sits down to deliver, let him spread the sheet that hangs over the bed, upon his lap, and under that cover, take out and dispose the blades on each side of the patient; by which means, he will often be able to deliver with the forceps, without their being perceived by the woman herself, or any other of the attendants. Some people pin a sheet to each shoulder, and throw the other end over the bed,
bed, that they may be the more effectually concealed from the view of those who are present: but this method is apt to confuse and embarras the operator. At any rate, as women are commonly frightened at the very name of an instrument, it is advisable to conceal them as much as possible, until the character of the operator is fully established.

The different ways of using the Forceps.

When the Head is down to the Os Externum.

When the head presents fair, with the forehead to the sacrum, the occiput to the pubes, and the ears to the sides of the pelvis, or a little diagonal; in this case, the head is commonly pretty well advanced in the bason, and the operator seldom miscarries in the use of the forceps. Things being thus situated, let the patient be laid on her back, her head and shoulders being somewhat raised, and the breech advanced a little over the side or foot of the bed; while the attendants fitting on each side support her legs, at the same time keeping her knees duly separated and raised up to the belly, and her lower parts always covered with the bed cloaths, that she may not be frightened, and the breech advanced a little over the side or foot of the bed; while the attendants fitting on each side support her legs, at the same time keeping her knees duly separated and raised up to the belly, and her lower parts always covered with the bed cloaths, that she may not be apt to catch cold. In order to avoid this inconvenience, if the bed is at a great distance from the fire, the weather cold and the woman of a delicate constitution, it is advisable to hide her face, and cover it with a low chair, and having lubricated with pomatum the blades of the forceps, and also his right hand and fingers, slide first the hand gently into the vagina, pushing it a long in a flattened form, between that and the child's head, until the fingers have passed the os internum; then, with his other hand, let him take one of the blades of the forceps from the place where it was deposited, and introduce it between his right hand and the head; if the point or extremity of it should flick at the ear, let it be flipp backward a little, and then guided forwards with a slow and delicate motion; when it shall have passed the os uteri, let it be advanced still farther up, until the rent at which the blades lock into each other be close to the lower part of the head, or at least within an inch thereof.

Having in this manner introduced one blade, let him withdraw his right hand, and intimate his left in the same direction, along the other side of the head, until his fingers shall have passed the os internum; then taking out the other blade from the place of concealment, with the hand that is difengaged, let it be applied to the other side of the child's head, by the same means employed in introducing the first; then the left hand must be withdrawn, and the head being embraced between the blades, let them be locked in each other. Having thus secured them, he must take a firm hold with both hands, and, when the pain comes on, begin to pull the head along from side to side, continuing this operation during every pain until the vertex appears through the os externum, and the neck of the child can be felt with the finger below the os pubis; at which time, the forehead pushes out the perineum like a large tumour: then let him stand up, and raising the handles of the forceps, pull the head upwards also, that the forehead being turned half round upwards, the perineum and lower parts of the os externum may not be tore.

In stretching the os externum or internum, we ought to imitate nature: for in practice we find, that when they are opened slowly, and at intervals, by the membranes with the waters, or the child's head, the parts are seldom inflamed or lacerated: but in all natural labours, when these parts are suddenly opened, and the child delivered by strong and violent pains, without much intermission, this misfortune sometimes happens, and the woman is afterwards in great pain and danger.

We ought therefore, when obliged to dilate those parts, to proceed in that slow, deliberate manner; and though upon the first trial, they feel so rigid, that one would imagine they could never yield or extend; yet, by stretching with the hand, and retting by intervals, we can frequently overcome the greatest resistance. We must also, in such cases, be very cautious, pulling slowly, with intermissions, in order to prevent the same laceration: for which purpose too, we ought to lubricate the perineum with pomatum, during those short intervals, and keep the palm of one hand close prefixed to it and the neighbouring parts, while with the other we pull at the extremity of the handles of the forceps; by which means, we preferre the parts, and know how much we may venture to pull at a time. When the head is almost delivered, the parts, thus stretched, must be flipp over the forehead and face of the child, while the operator pulls upwards with the other hand, turning the handles of the forceps to the abdomen of the woman.

This method of pulling upwards, raises the child's head from the perineum, and the half round turn to the abdomen of the mother brings out the forehead and face from below; for, when that part of the hind-head which is joined to the neck, rests at the under-part of the os pubis, the head turns upon it, as upon an axis. In preternatural cases also, the body being delivered, mul in the same manner be raised up over the belly of the mother, and at the same time the perineum flipp over the face and forehead of the child.

In the introduction of the forceps, let each blade be pushed up in an imaginary line from the os externum, to the middle space betwixt the navel and forobicular cordis of the woman; or, in other words, the handles of the forceps are to be held as far back as the perineum will allow. The introduction of the other hand to the opposite side, will, by pressing the child's head against the first blade, detain it in its proper place till the other can be applied; or, if this pressure should not seem sufficient, it may be supported by the operator's knee.

When the head is come low down, and cannot be brought farther, because one of the shoulders rests above the os pubis, and the other upon the upper-part of the sacrum, let the head be strongly grasped with the forceps, and pulled up as far as possible, moving from blade to blade as you pull up, that the shoulders may be the more easily moved to the sides of the pelvis, by turning the face or forehead a little towards one of them; then, the forehead must be brought back again into the hollow of the sacrum, and another effort made to deliver: but, should
should the difficulty remain, let the head be pushed up again, and turned to the other side; because it is uncertain which of the shoulders rests on the os pubis, or sacrum. Suppose, for example, the right shoulder of the child sticks above the os pubis, the forehead being in the hollow of the sacrum; in this case, if the forehead be turned to the right-hand side of the woman, the shoulder will not move; whereas, if it be turned to the left, and the head at the same time pushed a little upwards, so as to raise and disengage the parts that were fixed, the right shoulder being towards the right-hand side, and the other to the left side of the brim of the pelvis, when the forehead is turned back again into the hollow of the sacrum, the obstacle will be removed, and the head be more easily delivered. This being performed, let the forceps be unlocked, and the blades disposed cautiously under the cloaths so as not to be discovered; then proceed to the delivery of the child, which, when the navel-string is cut and tied, may be committed to the nurse. The next care is to wipe the blades of the forceps, singly, under the cloaths, slide them warily into your pockets, and deliver the placenta.

When the forehead is to the Os Pubis.

When the forehead, instead of being towards the sacrum, is turned forwards to the os pubis, the woman must be laid in the same position as in the former case; because here also, the ears of the child are towards the sides of the pelvis, or a little diagonally situated, provided the forehead is towards one of the groins. The blades of the forceps being introduced along the ears, or as near them as possible, according to the foregoing directions, the head must be pushed up a little, and the forehead turned to one side of the pelvis; thus let it be brought along, until the hindhead arrives at the lower part of the ilium; when the forehead must be turned backward, into the hollow of the sacrum, and even a quarter or more to the contrary side, in order to prevent the shoulders from hitching on the upper part of the os pubis, or sacrum, so that they may be still towards the sides of the pelvis; then let the quarter turn be reversed, and the forehead being replaced in the hollow of the sacrum, the head may be extracted as above. In performing these different turns, let the head be pushed up or pulled down occasionally, as it meets with least resistance. In this case, when the head is small, it will come along as it presents; but if large, the chin will be so much pressed against the breast, that it cannot be brought up with the half-round turn, and the woman will be tore if it comes along. See Plate CXII, where

**Fig. 3.** Shews the head of the fetus, by strong labour-pains, squeezed into a longish form, with a tumour on the vertex, from a long compression of the head in the pelvis.

K, The tumour on the vertex.

L, The forceps.

M, The vesica urinaria much distended, with a large quantity of urine from the long pressure of the head against the urethra.

N, The under part of the uterus.

OO, The os uteri.

When the forehead and face of the child are turned to the side of the pelvis, (in which case it is higher than in the first situation,) it will be difficult, if the woman lies on her back, to introduce the forceps so as to grasp the head with a blade over each ear; because the head is often pressed so hard against the bones, in this position, that there is no room to separate the fingers between the ear and the os pubis. So as to introduce the blades safely, on the inside of the os internum, or push one of them up between the fingers and the child's head. When things are so situated, the belt posture for the woman is that of lying on one side, as formerly directed, because the bones will yield a little, and the forceps (of consequence) may be the more easily introduced.

Suppose her lying on her left side, and the forehead of the child turned to the same side of the pelvis; let the fingers of the operator's right hand be introduced along the ear, between the head and the os pubis, until they pass the os internum: if the head is immovably fixed in the pelvis, that there is no passage between them, let his left hand be pushed up between the sacrum and the child's head, which being raised as high as possible, above the brim of the pelvis, he will have room sufficient for his fingers and forceps; then let him slide up one of the blades, with the right hand, remembering to press the handle backwards to the perineum, that the point may humour the turn of the sacrum and child's head; this being effected, let him withdraw his left hand, with which he may hold the handle of the blade, already introduced, while he insinuates the fingers of his right hand at the os pubis, as before directed, and pushes up the other blade, slowly and gently, that he may run no risk of hurting the os internum or bladder; and here also keep the handle of it as far backwards as the perineum will allow: when the point has passed the os internum, let him slide it up farther, and join the legs by locking them together, keeping them still in a line with the middle space between the navel and scrobiculus cordis. Then let him pull along the head, moving it from side to side, or from one ear of the child to the other; when it is sufficiently advanced, let him move the forehead into the hollow of the sacrum, and a quarter-turn farther, then bring it back into the same cavity; but, if the head will not easily come along, let the woman be turned on her back after the forceps have been fixed, and the handles firmly tied with a garter or fillet; let the hindhead be pulled half round forwards, from below the os pubis, and the instrument and child managed as before.

When the head cannot be raised above the brim of the pelvis, or the fingers introduced within the os internum, to guide the points of the forceps along the ears, especially at the os pubis, ischium, or sacrum; let the fingers and hand be pushed up as far as they will go, along the open space between the sacrum and ischium; then one of the blades may be introduced, moved to, and fixed over the ear, the situation of which is already known: the other hand may be introduced, and the other blade conducted in the same manner, on the opposite side of the pelvis; but, before they...
they are locked together, care must be taken that they are exactly opposite to each other, and both sufficiently introduced. In this case, if the operator finds the upper part of the facrum jetting, in so much that the point of the forceps cannot pass it, let him try with his hand to turn the forehead a little backwards, so that one ear will be towards the groin, and the other towards the side of that prominence; consequently, there will be more room from the blades to pass along the ears: but if the forehead should remain immovable, or though moved return to its former place, let one blade be introduced behind one ear, and its fellow before the other, in which case the introduction is sometimes more easily performed when the woman lies on her back, than when she is laid on one side. See Plate CXII. fig. 2.

When the Face presents.

When the face presents, resting on the upper part of the pelvis, the head ought to be pushed up to the fundus uteri, the child turned and brought by the feet, because the hind head is turned back on the shoulders, and, unless very small, cannot be pulled along with the forceps; but should it advance pretty fast in the pelvis, it will be sometimes delivered alive, without any resistance. But, if it defends slowly, or, after it is low down, flicks for a considerable time, the long pressure on the brain frequently destroys the child, if not relieved in time, by turning or extracting with the forceps.

When the head is detained very high up, and no signs of its descending appear, and the operator having stretched the parts with a view to turn, discovers that the pelvis is narrow, and the head large, he must not proceed with turning, because after this hath been performed, perhaps with great difficulty, the head cannot be delivered without the assistance of the crotchet. No doubt it would be a great advantage in all cases where the face or forehead presents, if we could raise the head so as to alter the bad position, and move it so, with our hand, as to bring the crown of the head to present: and indeed this should always be tried, and more especially, when the pelvis is too narrow, or the head too large; and when we are dubious of saving the child by turning: but frequently this is impossible to be done, when the waters are evacuated, the uterus strongly contracted on the child, and the upper part of the head so slippery as to elude our hold; inomuch that, even when the pressure is not great, we seldom succeed, unless the head is small, and then we can save the child by turning. If you succeed, and the woman is strong, go on as in natural labour; but, if this fails, then it will be more advisable to wait with patience for the descent of the head, so as that it may be delivered with the forceps; and consequently the child may be saved; but, if it still remains in its high situation, and the woman is weak and exhausted, the forceps may be tried; and, should they fail, recourse must be had to the crotchet; because the mother’s life is always to be more regarded than the safety of the child.

When the face of the child is come down, and flicks at the os externum, the greatest part of the head is then squeezed down into the pelvis, and if not speedily delivered, the child is frequently lost by the violent contraction of the brain: besides, when it is so low down, it seldom can be returned, on account of the great contraction of the uterus. In this case, when the chin is turned towards the os pubis, at the lower part of that bone, the woman must be laid on her back, the forceps introduced, as formerly directed in the first case, and when the chin is brought out from under the os pubis, the head must be pulled half round upwards; by which means the fore and hind head will be raised from the perineum, and the under part of the os externum prevented from being tore.

If the chin points to either side of the pelvis, the woman must be laid on her side, the blades of the forceps introduced along the ears, one at the os pubis, and the other at the facrum; and the chin, when brought lower down, turned to the pubis, and delivered: for the pelvis being only two inches in depth at this place, the chin is easily brought from under it, and then the head is at liberty to be turned half round upwards; because the chin being disengaged from this bone, can be pulled up over it externally; by which means, two inches of room, at least, will be gained, for the more easy delivery of the fore and hind head, which are now pressed against the perineum. When the chin is towards the facrum, the hind head pressed back between the shoulders, so that the face is kept from rising up below the os pubis, the head must be pulled up with the hand, to the upper part of the pelvis, and the forceps introduced and fixed on the ears; the hindhead must be turned to one side of the pelvis, while the chin is moved to the other side, and, if possible, to the lower part of the ilium; then the hind head must be brought into the hollow of the facrum, with the chin below the os pubis, and delivered as above directed. If this cannot be done, let the operator try, with the forceps, to pull down the hind-head below the os pubis, and at the same time, with the fingers of the other hand, push the face and forehead backwards and upwards into the hollow of the facrum.

For when the chin points to the back part of the pelvis, the forehead is squeezed against the os pubis, while the hind-head is pressed upon the back, between the shoulders; so that the head cannot be delivered unless the occiput can be brought out from below the os pubis, as formerly described. See Plate CXII. fig. 4. and 5.

Fig. 4. shews, in the lateral view the face of the child presenting and forced down into the lower part of the pelvis, the chin being below the pubes, and the vertex in the concavity of the os facrum: The water being likewise all discharged, the uterus appears closely joined to the body of the child.

Fig. 5. shews, in a lateral view, the head of the child in the same position as in the former figure.

AB, The vertebrae of the loins, os facrum, and coccyx.
C, The os pubis of the left side.
D, The inferior part of the rectum.
E, The perineum.
F, The left labium pudendi.
GGG, The uterus.

The sum of all that has been said on this head, may be comprehended in the following general maxims.

Young practitioners are often at a loss to know and judge
judge by the touch in the vagina, when the head is far enough down in the back for using the forceps. If we were to take our observations from what we feel of the head at the os pubis, we should be frequently deceived; because in that place the pelvis is only two inches in depth, and the head will seem lower down than it really is; but if, in examining backwards, we find little or no part of it towards the sacrum, we may be certain that all the head is above the brim: if we find it down as far as the middle of the sacrum, one third of it is advanced; if as far down as the lower part, one half; and in this case, the largest part is equal with the brim. When it is in this situation, we may be almost certain of succeeding with the forceps; and when the head is so low as to protrude the external parts, they never fail. But these things will differ according to different circumstances, that may occasion a tedious delivery.

Let the operator acquire an accurate knowledge of the figure, shape, and dimensions of the pelvis, together with the shape, size, and position of the child’s head.

Let the breech of the woman be always brought forwards, a little over the bed, and her thighs pulled up to her belly, whether she lies on her side or back, to give room to apply, and to move the forceps up or down, or from side to side.

Let the parts be opened and the fingers pass the os internum; in order to which, if it cannot be otherwise accomplished, let the head be raised two or three inches, that the fingers may have more room; if the head can be raised above the brim, your hand is not confined by the bones; for, as we have already observed, the pelvis is wider from side to side, at the brim, than at the lower part; if the fingers are not past the os uteri, it is in danger of being included between the forceps and the child’s head.

The forceps, if possible, should pass along the ears, because, in that case, they seldom or never hurt or mark the head.

They ought to be pushed up in an imaginary line, towards the middle space between the navel and scrobiculus cordis, otherwise the ends will run against the sacrum.

The forehead ought always to be turned into the hollow of the sacrum, when it is not already in that situation. When the face presents, the chin must be turned to below the os pubis, and the hind-head into the hollow of the sacrum.

When the shoulders rest at the pubes, where they are detained, the head must be turned a large quarter to the opposite side, so as that they may lie towards the sides of the pelvis.

The head must always be brought out with an half round turn, over the outside of the os pubis, for the preservation of the perineum, which must at the same time be supported with the flat of the other hand, and slide gently backwards over the head.

When the head is so low as to protrude the parts, in form of a large tumour, and the vertex hath begun to dilate the os externum, but, instead of advancing, is long detained in that situation, from any of the forementioned causes of laborious cases, and the operator cannot exactly distinguish the position of the head, let him introduce a finger between the os pubis and the head, and he will frequently find the back part of the neck, or one ear, at the forehead, or towards the side of the pelvis: when the situation is known, he needs not stretch the os externum, and raise the head, as formerly directed; but he may introduce the forceps, and they being properly joined, and their handles tied, pull gently during every pain; or if the pains are gone, at the interval of four or five minutes, that the parts may be slowly dilated, as they are in the natural labour: but, when the situation cannot be known, the head ought to be raised. The same method may also be taken when the face presents, and is low in the pelvis, except when the chin is toward the back part: and in this case, the head ought to be raised likewise.

Almost all these directions are to be followed, except when the head is small, in which case it may be brought along by the force of pulling: but this only happens when the woman is reduced, and the labour-pains are not sufficient to deliver the child; for, the lower part of the uterus may be strongly contracted before the shoulders, and so close to the neck of the child, as to prevent its advancing, even when the head is so loose in the pelvis, that we can sometimes pull our fingers all round it: and this is oftentimes the occasion of preventing the head’s being delivered when low in the pelvis. The difficulty, when high up, is from the restraint at the brim; and when it passes that, the head is seldom retained in the lower part, unless the patient is weak. In this case, we need not wait, because we are commonly certain of relieving the woman immediately with the forceps, by which you prevent the danger that may happen both to the mother and child, by the head’s continuing to lodge there too long. This case should be a caution against breaking the membranes too soon, because the uterus may contract too forcibly and too long before the shoulders; when the head in this case is advanced one third or half way on the outside of the os externum, if the pains are strong, this last inconvenience is frequently remedied by introducing your two fingers into the rectum, as formerly directed: by these rules; delivery may (for the most part) be performed with ease and safety: nevertheless, the head is sometimes so squeezed and locked in the pelvis, and the hairy scalp so much swelled, that it is impracticable to raise up the head so as to come at the ears or os internum; or to distinguish the future of the skull, so as to know how the heads present. In this case, the forceps must be introduced at random, and the uncertainty of the position generally removed by remembering, that in those cases, where the head is squeezed down with great difficulty, the ears are for the most part towards the os pubis and sacrum; and that the forehead seldom turns into the hollow of the sacrum, before the occiput is come down to the lower part of the ischium; and then rises gradually towards the under part of the os pubis, and the perineum and anus are forced down before it, in form of a large tumour.

On such occasions, the woman being laid on her side, if one ear is to the sacrum and the other to the os pubis, the blades of the forceps are to be introduced; and if they meet with any resistance at the points, they must not be forcibly thrust up, lest they pass on the outside of the os uteri, and tear the vagina, which, together with the womb
womb, would be included in the instrument, and pulled along with the head; for this reason, if the blade does not easily pass, let it be withdrawn a little downwards, as before directed, and then pulled again, moving the point close to the head; if the ear obstructs its passage, let the point be brought a little outwards: and by these cautious efforts, it will at length pass without further resistance, and ought to be advanced a considerable way, in order to certify the operator that he is not on the outside of the os internum.

When the forceps are fixed, and the operator uncertain which way the forehead lies, let him pull slowly, and move the head with a quarter turn, first to one side and then to the other, until he shall have found the direction in which it comes most easily along.

If at any time we find the forceps begin to slip, we must reft, and pull them up again gently: but, if they are like to slip off at a side, un tie the handles, and move them so as to take a firmer hold, fix as before, and deliver. If we are obliged to hold with both hands, the parts may be supported by the firm application of an assistant's hand; for, without such cautious management, they will run a great risk of being lacerated; a misfortune which rarely happens, when the perinaeum is properly pressed back, and the head leisurely delivered. Sometimes, when the head is brought low down, you may take off the forceps, and help along with your fingers on each side of the coccyx, or in the rectum, as directed in the natural labour.

If the head is low down, the ears are commonly diagonal, or to the sides; and when the head is brought down one third, or one half, through the os externum, the operator can then certify himself, whether the forehead is turned to the coccyx or os pubis, by feeling with his finger for the back part of the neck or ear, between the os pubis and the head; and then move the head as above directed.

Let him try to alter with his hand every bad position of the head; and if it be detained high up in the pelvis, in consequence of the woman's weakness, the rigidity of the parts, the circumvolutions or shortness of the funis, or the contraction of the uterus over the shoulders of the child, the forceps will frequently succeed when the focus cannot be turned: but, if the head is large, or the pelvis narrow, the child is seldom saved either by turning or using the forceps, until the head shall be farther advanced. And here it will not be amiss to observe, that the blades of the forceps ought to be new covered with strips of washed leather after they have been used, especially in delivering a woman suspected of having an infectious disease.

The signs of a Dead Child.

When the head presents, and cannot be delivered by the labour-pains; when all the common methods have been used without success, the woman being exhausted, and all her efforts vain; and when the child cannot be delivered without such force as will endanger the life of the mother, because the head is too large or the pelvis too narrow; it then becomes absolutely necessary to open the head, and extract with the hand, forceps, or crotchet, Indeed this last method formerly was the common practice when the child could not be easily turned, and is still in use with those who do not know how to save the child by delivering with the forceps: for this reason, their chief care and study was to distinguish whether the focus was dead or alive; and as the signs were uncertain, the operation was often delayed until the woman was in the most imminent danger; or when it was performed sooner, the operator was frequently accused of rashness, on the supposition that the child might in time have been delivered alive by the labour-pains: perhaps he was sometimes conscious to himself of the justice of this imputation, although what he had done was with an upright intention.

The signs of a dead focus were, first, the child's ceasing to move and stir in the uterus. Secondly, The evacuation of meconium, though the breech is not pressed into the pelvis. Thirdly, No perceivable pulsation at the fontanelle and temporal arteries. Fourthly, A large swelling or tumour of the hairy scalp. Fifthly, An uncommon laxity of the bones of the cranium. Sixthly, The discharge of a fetid ichor from the vagina, the effluvia of which surround the woman and gave rise to the opinion that her breath conveyed a mortified smell. Seventhly, Want of motion in the tongue, when the face presents. Eighthly, No perceivable pulsation in the arteries of the funis umbilicalis, when it falls down below the head; nor at the wrist when the arm presents; and no motion of the fingers. Ninthly, The pale and livid countenance of the woman. Tenthly, A collapsing and flaccidity of the breast. Eleventhly, A coldness felt in the abdomen, and weight, from the child's falling like a heavy ball to the side on which the lies. Twelfthly, A separation of the hairy scalp on the slightest touch, and a distinct perception of the bare bones.

All or most of these signs are dubious and uncertain, except the last, which can only be observed after the focus hath been dead several days. One may also certainly pronounce the child's death, if no pulsation hath been felt in the navel string for the space of twenty or thirty minutes; but the same certainty is not to be acquired from the arm, unless the skin can be stripped off with ease.

When the Crotchett is to be used.

Midwifery is now so much improved, that the necessity of destroying the child does not occur so often as formerly: indeed it never should be done, except when it is impossible to turn, or to deliver with the forceps; and this is seldom the case but when the pelvis is too narrow, or the head too large to pass, and therefore rests above the brim: for this reason, it is not so necessary for the operator to puzzle himself about dubious signs; because in these two cases, there is no room for hesitation: for if the woman cannot possibly be delivered in any other way, and is in imminent danger of her life, the best practice is undoubtedly to have recourse to that method which alone can be used for her preservation, namely, to diminish the bulk of the head.

In this case, instead of destroying, you are really saving a life; for, if the operation be delayed, both mother and child are lost.
The method of using the Scissors, blunt Hook, and Crotchets.

When the head presents, and such is the case that the child can neither be delivered by turning, nor extracted with the forceps, and it is absolutely necessary to deliver the woman to save her life, this operation must then be performed in the following manner.

The operator must be provided with a pair of curved crotchets, made according to the improvements upon those proposed by Mefnard, together with a pair of scissors about nine inches long, with reeds near the middle of the blades, and the blunt hook.

Of the Woman's Posture.

The patient ought to be laid on her back or side in the same position directed in the use of the forceps; the operator must be seated on a low chair, and the instruments concealed and disposed in the same manner, and for the same reason mentioned in treating of the forceps. The parts of the woman have already, in all likelihood, been sufficiently dilated by his endeavours to turn or deliver with the forceps; or if no efforts of that kind have been used, because by the touch he had learned that no such endeavours would succeed, as in the case of a large hydrocephalus, when the bones of the cranium are often separated at a great distance from each other; or upon perceiving that the pelvis was extremely narrow: If, upon these considerations, he hath made no trials in which the parts were opened, let him gradually dilate the os externum and internum, as formerly directed.

The head is commonly kept down pretty firm, by the strong contraction of the uterus round the child; but should it yield to one side, let it be kept steady by the hand of an assistant, pressing upon the belly of the woman; let him introduce his hand, and press two fingers against one of the futures of the cranium; then take out his scissors from the place in which they were deposited, and guiding them by the hand and fingers till they reach the hairy scalp, push them gradually into it, until their progress is stopped by the reeds.

If the head slips aside, in such a manner, as that they cannot be pushed into the skull at the future, they will make their way through the solid bones, if they are moved in a semicircular turn, like the motion of boring, and this method continued till you find the point firmly fixed; for, if this is not observed, the points slide along the bones.

The scissors ought to be so sharp at the points, as to penetrate the interguments and bones when pushed with a moderate force; but not so keen as to cut the operator's fingers, or the vagina in introducing them.

The scissors being thus forced into the brain, as far as the reeds at the middle of the blades, let them be kept firm in that situation; and the hand that was in the vagina being withdrawn, the operator must take hold of the handles with each hand, and pull them a sufficient, that the blades may dilate and make a large opening in the skull; then they must be bent, turned, and again pulled aunder, so as to make the incision crucial; by which means the opening will be enlarged, and sufficient room made for the introduction of the fingers: let them be afterwards closed, and introduced even beyond the reeds; when they must again be opened, and turned half round from side to side, until the structure of the brain is effectively destroyed, that it can be evacuated with ease. This operation being performed, let the scissors be shut and withdrawn; but, if this instrument will not answer the last purpose, the business may be done by introducing the crotchets within the opening of the skull. The brain being thus destroyed, and the instrument withdrawn, let him introduce his right hand into the vagina, and two fingers into the opening which hath been made, that if any sharp splinters of the bones remain, they may be broken off and taken out; lest they should injure the woman's vagina, or the operator's own fingers.

If the case be an hydrocephalus, let him fix his fingers on the inside and his thumb on the outside of the opening, and endeavour to pull along the skull in time of a pain; but, if labour is weak, he must desire the woman to assist his endeavours by forcing down; and thus the child is frequently delivered; because, the water being evacuated, the head collapses of course.

But when the pelvis is narrow, the head requires much greater force to be brought along; unless the labour-pains are strong enough to press it down and diminish it, by squeezing out the cerebrum: in this case, let the operator withdraw his fingers from the opening, and, holding them along the head, press the os uteri; then, with his left hand, taking one of the crotchets from the place of its concealment, introduce it along his right hand, with the point towards the child's head, and fix it above the chin in the mouth, back part of the neck, or above the ears, or in any place where it will take firm hold; having fixed the instrument, let him withdraw his right hand, and with it take hold on the end or handle of the crotch; then introduce his left to seize the bones at the opening of the skull (as above directed) that the head may be kept steady, and pull along with both hands.

If the head is still detained by the uncommon narrowness of the pelvis, let him introduce his left hand along the opposite side, in order to guide the other crotch; which being also applied and locked or joined with its fellow, in the manner of the forceps, he must pull with sufficient force, moving from side to side, and as it advances, turn the fore head into the hollow of the sacrum, and extract as with the forceps, humouring the shape of the head and pelvis during the operation, which ought to be performed slowly, with great judgment and caution; and from hence it appears absolutely necessary to know how the head presents, in order to judge how the crotchets must be fixed, and the head brought along to the best advantage.

If, when the head is delivered in this manner, the body cannot be extracted, on account of its being much swelled, of a monstrous size, or (which is most commonly the case) the narrowness of the pelvis; let him descend from pulling, left the head should be separated from the body, and introducing one hand so as to reach with his fingers to the shoulder-blades or breast, conduct along it one of the crotchets, with the point towards the occiput, and fix it with a firm application; then withdrawing his hand, employ it in pulling the crotch, while the other
is exerted in the same manner upon the head and neck of the child; if the instrument begins to lose its hold, he must push it farther up, and fixing it again, repeat his efforts, applying it still higher and higher, until the body is extracted.

Of Preternatural Labours.

Preternatural labour happens, when, instead of the head, some other part of the body presents to the os uteri. Preternatural labours are more or less difficult according to the presentation of the child, and the contraction of the uterus round its body. The nearer the head and shoulders are the os internum or lower part of the uterus, the more difficult is the case; whereas, when the head is towards the fundus, and the feet or breech near the os internum, it is more easy to turn and deliver.

To begin with the easiest of these first, it may be proper to divide them into three classes. First, how to manage when the feet, breech, or lower parts present. Secondly, how to behave in violent floodings; and, when the child presents wrong before the membranes are broke, how to save the waters in the uterus, that the foetus may be the more easily turned: and what method to follow even after the membranes are broke, when all the waters are not evacuated. Thirdly, how to deliver when the uterus is strongly contracted; the child presenting either with the fore or back parts; and lying in a circular form, or with the shoulders, breech, neck, face, ear, or vertex, and lying in a longish form, with the feet and breech towards the fundus of the womb, which is contracted like a long sheath, close to the body of the foetus; and when the fore-parts of the child lie towards the side, fundus, fore or back part of the uterus.

The first class of Preternatural Labours. When the feet, breech, or lower parts of the foetus present, and the head, shoulders, and upper parts are towards the fundus.

These, for the most part, are accounted the easiest, even although the uterus should be strongly contracted round the body of the child, and all the waters discharged.

If the knees or feet of the child present to the os internum, which is not yet sufficiently dilated to allow them and the body to come farther down; or, if the woman is weak, wore out with long labour, or endangered by a flooding; let the operator introduce his hand into the vagina, push up and stretcher the os uteri, and bring along the feet; which being extracted, let him wrap a linen cloth round them, and pull until the breech appears on the outside of the os externum: if the face or fore-part of the foetus is already towards the back of the uterus, let him perfect in pulling in the same direction; but, if they are towards the os pubis, or to one side, they must be turned to the back-part of the uterus; and as the head does not move round equal with the body, he must make allowance for the difference in turning, by bringing the last one quarter farther than the place at which the head is to be placed; so that the face or forehead which was towards one of the groins will be forced to the side of the sacrum, where it joins with the ischium. This quarter turn of the body must be again undone, without affecting the position of the head; a cloth may be wrapped round the breech, for the convenience of holding it more firmly; then, placing a thumb along each side of the spine, and with his fingers grasping the belly, let him pull along the body from side to side, with more or less force, according to the resistance: when the child is delivered as far as the shoulders, let him slide his hand flattened (suppose the right, if the lies on her back) between its breast and the perineum, coccyx, and sacrum of the woman, and introduce the fore or middle finger (or both, if necessary) into the mouth of the foetus; by which means, the chin will be pulled to the breadth, and the forehead into the hollow of the sacrum. And this expedient will also raise upwards the hindhead, which rests at the os pubis.

When the forehead is come so low as to protrude the perineum, if the woman lies on her back, let the operator stand up, and pull the body and head of the child upwards, bringing the forehead with an half-round turn from the under part of the os externum, which will thus be defended from laceration. The application of the fingers in the child's mouth will contribute to bring the head out in this manner, prevent the os externum from hitherto on the chin, help along the head, and guard the neck from being overstrained; a misfortune which would infallibly happen, if the forehead should be detained at the upper part of the sacrum: nor is there any great force required to obviate this inconvenience, or the least danger of hurting the mouth, if the head is not larger for, if the head cannot be brought along with moderate force; and the operator is afraid of injuring or over-straining the lower jaw, let him push his fingers farther up, and press on each side of the nose, or on the inferior edges of the pockets of the eyes. If the legs are come out, and the breech pulled into the vagina, there is no occasion for pushing up to open, but only to pull along and manage as above directed; still remembering to raise the forehead flowly from the perineum, which may be pressed back with the fingers of his other hand.

In the case of a narrow pelvis, or large head, which cannot be brought along without the risk of over-straining the neck, let him slide up his fingers and hand into the vagina, and bring down one of the child's arms, at the same time pulling the body to the contrary side, by which means the shoulder will be brought lower down: let him run his fingers along the arm, until they reach the elbow; which must be pulled downwards with an half round turn to the other side, below the breast. This must not be done with a jerk, but flowly and cautiously, in order to prevent the dislocation, bending, or breaking of the child's arm.

Let him again guide his fingers into the child's mouth, and try if the head will come along: if this will not succeed, let the body be pulled to the other side, so as to bring down the other shoulder; then slide up his left hand, and, extracting the other arm, endeavour to deliver the head. If one finger of his right hand be fixed in the child's mouth, let the body rest on that arm; let him place the left hand above the shoulders, and put a finger on each side of the neck: if the forehead is towards one
fide at the upper part of the pelvis, let him pull it lower
down, and gradually turn it into the hollow of the fa-
crum; then stand up, and, in pulling, raise the body, so as to bring out the head in an half-round turn, as above
directed.

When the forehead is hindered from coming down in-
to the lower part of the facrum by an uncommon shape of
the head or pelvis, and we cannot extract it by bringing
it out with an half-round turn at the os pubis, we must
try to make this turn in the contrary direction; and in-
stead of introducing our fingers into the child’s mouth,
let the breadth of it rest on the palm of your left hand,
(the woman being on her back,) and placing the right on
its shoulders, with the fingers on each side of the neck,
press it downwards to the perineum. In consequence of
this pressure, the face and chin being within the perineum,
will move more upwards, and the head come out with an
half-round turn from below the os pubis: for this pur-
pose of motion is now where the fore-part of the neck presses
at the perineum; whereas, in the other method, the back
part of the neck is against the lower part of the os pubis,
on which the head turns.

If the forehead is not turned to one side, but flicks at
the upper part of the facrum, especifally when the pelvis
is narrow; let him endeavour, with his finger in the
mouth, to turn it to one side of the jetting in of the fa-
crum, because the pelvis is wider at the sides of the brim,
and bring it along as before.

If one of the child’s arms, instead of being placed a
long the sides of the head, is turned in between the face
and facrum, or between the hindhead and os pubis, the
same difficulty of extracting occurs as in a large head or
narrow pelvis; and this position frequently ensues, when
the fore-parts of the child’s body are turned from the os
pubis down to the facrum: if they are turned to the left
side of the woman, the left hand and arm are commonly
brought in before the face, and vice versa; but, in these
cases, the elbow is, for the most part, easily come at,
because it is low down in the vagina, and then there is a
necessity for bringing down one or both arms before the
head can be delivered: from whence we may conclude,
that those authors are sometimes in the wrong, who ex-
pressly forbid us to pull down the arms. Indeed, if the
pelvis is not narrow, nor the head very large, and the arms
lie along the sides of the head, there is seldom occasion
to pull them down; because, the pelvis is wider at the
sides, and the membranes and ligaments that fill up the
space between the facrum and ilia yield to the pres-
sure, and make room for the passage of the head: but
when they are squeezed between the head and the facrum,
ilia, or os pubis, and the head flicks in the pelvis, they
certainly ought to be brought down, or even when the
head comes along with difficulty. Neither is the al-
leged contraction of the os internum round the neck of
the child so frequent as hath been imagined; because,
for the most part, the contraction embraces the head and
not the neck: but, should the neck alone suffer, that in-
convenience may be removed by introducing the hand in-
to the vagina, and a finger or two into the child’s mouth,
or on each side of the nose: by which means also a suf-
ficient dilatation will be preferred in the os externum,
which frequently contracts on the neck, as soon as the
arms are brought out.

The diameter, from the face or forehead to the ver-
tex, being greater than that from the forehead to the
back part of the hindhead or neck, when the hindhead
rests at the os pubis, and the forehead at the upper part
of the facrum, the head can seldom be brought down,
except the operator, by introducing a finger into the mouth,
moves the same to the side, brings the chin to the breast,
and the forehead into the hollow of the facrum; by which
means, the hindhead is raised, and allowed to come along
with greater ease; and in pulling, half the force only is
applied to the neck, the other half being exerted upon the
head, by the finger which is fixed in the mouth; so that
the forehead is more easily brought out, by pulling up-
wards, with the half-round turn from the perineum.

When the operator, with his fingers in the child’s mouth,
cannot pull down the forehead into the hollow of the fa-
crum, let him pull the fore-finger of his left hand between
the neck and os pubis, in order to raise the hindhead up-
wards; which being done, the forehead will come down
with less difficulty, especially if he push up and pulls
down at the same time, or alternately.

If it be discovered by the touch, that the breech pre-
sents, that the membranes are not yet broke, the woman
in no danger, the os internum not yet sufficiently dilated,
and the labour-pains strong; the midwife ought to wait
until the membranes, with the waters, are pushed far-
ther down, as in the natural labour: for, as they come
down through the os uteri into the vagina, they stretch
open the parts contained in the pelvis; and the bulk within
the uterus being diminished, it contracts and comes in
contact with the body of the child; so that the breech is
pushed along by the mechanical force of the abdominal
muscles operating upon the womb.

The same consequence will follow even although the
membranes are broke; for the waters lubricate the parts
as they flow off; and the breech, if not too large, or the
pelvis narrow, is pushed down. In this case, when the
nates present equal and fair to the os uteri, so it is also
reasonable to conclude, that when the breech presents, it
lies in the same manner, but that the fore-parts of the
child are rather turned backwards to one side of the ver-
tex: of the loins: in this position, one hip will present,
and the other rest on the os pubis; but, when forced along
with pains, the last will be gradually moved more and
more to the groin of that side, and from hence slip down
at the side of the basin: the lower at the same time will
be forced to the other, and the hollow betwixt the thighs
will rest upon the jetting in of the os facrum, and come
down in that manner; the thighs on each side, and the
back and round part of the breech passing in below the
arch of the os pubis, which is the best position: but if the
back of the child is tilted backwards, then it will be for-
ced down in the contrary direction, and come along with
more difficulty, viz. the thighs to the os pubis, and back
to the facrum; when it is come down to the middle or
lower part of the pelvis, let the operator introduce the
fore-finger of each hand, along the outside, to the groins,
and, taking hold, pull gently along during a strong pain.

If the os externum is so contracted, that he cannot
take sufficient hold, let it be opened slowly, so as to al-
low his hands to be pushed up with ease; when he has
infiltrated a finger or two in each groin, let him place his
thumbs on the thighs, if they are towards the os pubis,
so as to obtain a firm hold; then pull along from side to
side, and, if the back of the child is to the os pubis, con-
tinue in that manner, until the body and head are
derived: the legs being commonly stretched up along
the belly and back, when the child is extracted as far as
the shoulders, they come out of themselves, or are easily
brought down; but, if the belly of the child is turned to
one side, or to the os pubis, in that case, when the breech
is delivered, he ought to turn the belly down to the fa-
crum, and the back to the os pubis; and that the face
may be also turned to the back of the mother, let him re-
member the quarter extraordinary, which must be again
reversed, and then he may pull along and deliver.

If the body cannot be turned until the thighs and legs
are brought down, either on account of the bulk, or be-
cause the hold on the breech is not sufficient, let him con-
tinue to pull along, until the hands appear on the outside
of the os externum; then seize one of the knees with his
finger and thumb, and extract that leg; and let the other
be brought down in the same manner. If he attempts to
pull out the legs, before the hands arrive at this place,
the thighs are always in danger of being bent or broke.

When the legs are delivered, let him wrap a cloth round
the breech of the child, and as the body was pulled down
almost as far as the breast, before the legs could be brought
out, it must be pulled up again to the navel, or above it;
because, without this precaution, the shoulders would be
so much engaged in the pelvis, that it would be imprac-
ticable to make the motions formerly directed, so as to
turn the face to the back of the mother: whereas, when
the body is pulled up, these turns can be effected with
greater ease, because the belly being in the pelvis, it
yields easier to the form of the basin. When the face
is turned properly down, let him proceed to deliver, as
above directed.

If the breech is detained above the pelvis, either by
its uncommon magnitude, or the narrowness of the basin;
or if one of the nates is pushed in, while the other recls
above the os pubis, facrum, or to either side; if the wo-
man is low and weak, the pains lingering and insufficient
to force the child along; or if (he is in danger from a vio-
let flooding: in any of these cases, let him (during e-
very pain) gradually open first the os externum, and then
the os internum, with his fingers and hand. Having thus
gained admission, let him push up the breech to the fore
or back part, or to one side of the uterus, that his hand
and arm may have room to slide along the fore-parts or
belly of the child, so as to feel the thighs, that will di-
rect him to the legs, which must be brought down with
his fingers, while, at the same time, he pushes up the
hams with his thumb, that in case the legs lie straight
up, they may be extracted with more ease by the flexion
of the knee, and run the legs risk of being bent, broke,
or oversize: for, if they are folded downward, they
are the more easily brought out.

If the breech be strongly pressed into the upper part of
the pelvis, let him also push it upwards and to one side,
that his hand and arm may have free passage; for the
higher the breech is raised out of his way, he will be at
more freedom to extract the legs.

If both legs cannot be easily brought down, he may
safely deliver with one, of which taking hold with a linen
cloth wrapped round it, let him slide his other hand into
the vagina, and a finger or two into the outside of
the groin which is bent: by these means, the hip will
come down the easier, and the leg, which is already ex-
tracted, will not be over-strained by involving the whole
force of pulling the body along.

If the legs lie towards the left side of the woman, who
is laid on her back, the right hand must be introduced
into the uterus; if they lie to her right side, the left
hand will better answer the purpose; and if they are to-
wards her back or belly, either hand may be indifferent-
ly used.

In all cases where the breech presents, the safest prac-
tice is always to pull up and bring down the legs, pro-
vided the os uteri is sufficiently dilated, and the waters
not wholly discharged. If the waters are evacuated, the
uterus strongly contracted around the child, the breech
low, so that it cannot be returned, or so small as to
come easily along, we ought then to deliver it accord-
gingly; but, if so large as neither to be pulled up or brought
along with the assistance of the fingers, let the operator
introduce the curved handle of the blunt crotchet into
one of the groins, his fingers into the other, and pull
evry cautiously, in order to prevent a fracture or dislo-
cation of the thigh bone, which might otherwise happen
from the use of this instrument, the blunt point of which
must be sufficiently past the groin. A fillet may also be
used for the same purpose.

In the foregoing cases the woman was supposed to be
laid on her back, her legs supported, and breech to the
bed-side; this being generally the best position for deli-
vering the body and head: indeed, when the child is
small, the may lie on her side, and the same methods be
used in delivering, provided the operator still remembers
that in this position the ilium and ischium of one side
are down, and the others up. Besides, when the breech
is pulled up, in order to bring down the legs, if they
lie forwards towards the fore part of the uterus, and the
belly is pendulous, he can reach them with the greatest
ease when lies on one side, or, if the resitance is
very great, turn her to her knees and elbows; but, when
the legs are delivered, if the child is large, or the pelvis
narrow, the ought to be turned upon her back, because
the body and head can be better and safer delivered by
pulling up and down; and in that posture she is also kept
more firm, and her thighs less in the operator's way, than
when she lies upon her side. See Plate CXIII. fig. 1. and 2.

The second class of Preternatural Labours.

When the membranes are broke, but the face, shoul-
der, or some other part of the child, being pushed into
the pelvis, locks up the os externum, so as that a small
quantity of the waters hath been discharged, the uterus
is kept from contracting strongly round the child, which
is therefore more easily turned than possibly can be when
they are all gone:

When
When, before the membranes are broke, the child is felt through them, preferring wrong, and at the same time the pains put them down so as to dilate the os internum more or less:

When the woman, at any time in the four last months, is seizes with a violent flooding that cannot be restrained, and unless speedily delivered must lose her life; if labour-pains cannot be brought on by stretching the parts, delivery must be forced; but, if she is in labour, and the membranes have been pulled down with the waters, they may be broke; by which means, the flooding is frequently diminished, and the child delivered by the labour-pains.

In these three different cases, if we can prevent the strong contraction of the uterus by keeping up the waters, we can also for the most part turn the child with great ease, even in the very worst positions.

In the first case, let the operator slowly introduce his hand into the vagina, and his fingers between that part of the child which is pushed down, and the os internum: if in so doing he perceives some of the waters coming along, he must run up his hand as quick as possible into the uterus, betwixt the inside of the membranes and the child's body; the lower part of his arm will then fill up the os externum like a plug, so that no more of the waters can pass; let him turn the child with its head and shoulders up to the fundus, the break down to the lower part of the uterus, and the fore-parts towards the mother's back; let the hand be pushed no farther up than the middle of the child's body, because, if it is advanced as high as the fundus, it must be withdrawn lower, before the child can be turned; and by these means the waters will be discharged, and the uterus of consequence contracted so as to render the turning more difficult.

In the second case, when the membranes are not broke, and we are certain that the child does not present fair; if the os internum is not sufficiently dilated, and the woman is in no danger, we may let the labour go on, until the parts are more stretched; lubricating and extending the os externum, by degrees, during every pain. Then introducing one hand into the vagina, we infinuate it in a flattened form, within the os internum, and push up between the membranes and the uterus, as far as the middle of the womb: having thus obtained admittance, we break the membranes by grasping and squeezing them with our fingers, slide our hand within them, without moving the arm lower down, then turn and deliver as formerly directed; but if, in any of these cases, you find the head is large or the pelvis narrow, bringing down the head into the natural position, and affist as directed in lingering or laborious cases.

If the woman (in the third case) is attacked with a violent flooding, occasioned by a separation of all or any part of the placenta from the uterus, during the last four months of pregnancy, and every method has in vain been tried to lessen and restrain the discharge, the operator ought to pronounce the case dangerous, and prudently declare to the relations of the patient, that unless she is speedily delivered, both she and the child must perish, observing at the same time, that by immediate delivery they may both be saved; let him also give the assistance and advice of some person eminent in the profession, for the satisfaction of her friends, and the support of his own reputation. Where there are no labour-pains, and the mouth of the womb is not dilated, it is sometimes very difficult to deliver, more especially if the os internum is not a little lax, but feels rigid.

If the os uteri is so much contracted, that the finger cannot be introduced, some authors have recommended a dilator, by which it may be gradually opened so as to admit a finger or two. Doubtless, some cases may happen, in which this may be necessary. If in stretching the os internum, labour-pains are brought on, let the operator slowly proceed and encourage them: when the mouth of the womb is opened, if the head presents and the pains are strong, by breaking the membranes the flooding will be diminished; but, if she floods to such a degree as to be in danger of her life, and the dilatation does not bring on labour, at least not enough for the occasion, she must be immediately delivered in the following manner: but in the first place let her friends be apprized of the danger, and the operator beware of promising to save either mother or child.

The operator having performed his duty in making the friends acquainted with the situation of the case, must gently open the os externum, by introducing his fingers gradually, turning them half round and pushing upward; then forming them, with the thumb, into the figure of a wedge or cone, continue to dilate slowly and by intervals, until his hand is admitted into the vagina: having thus far gained his point, let him introduce, in the same slow cautious manner, first one, then two fingers, into the os internum, which may be dilated so as to admit the other two and the thumb in the same conical form, which will gradually make way for sliding the hand along between the outside of the membranes and inside of the uterus; then he must manage as directed in the second case: if, upon sliding his hand upon the outside of the membranes, he feels the placenta adhering to that side of the womb, he must either withdraw that hand, and introduce the other on the opposite side, or break through the membranes at the lower edge of the placenta.

The greatest danger in this case frequently proceeds from the sudden emptying of the uterus and belly; for when labour comes on of itself, or is brought on in a regular manner, and the membranes are broke, the flooding is gradually diminished, and first the child, then the placenta, is delivered by the pains; so that the pressure or resistance is not all at once removed from the belly and uterus of the woman, which have time to contract by degrees; consequently, those fainting fits and convulsions are prevented which often proceed from a sudden removal of that compression under which the circulation was performed.

The younger the woman is with child, the greater is the difficulty in opening the os internum; and more so in the first child, especially if she is past the age of thirty-five.

We should never refuse to deliver in these dangerous cases, even although the patient seems expiring: for, immediately after delivery, the uterus contracts; the mouths of the vessels are shut up, so that the flooding ceases; and she may recover, if she lives five or six hours.
after the operation, and can be supported by frequent
draughts of broth, jelly, custard, weak cordial, and ano-
dye medicines, which maintain the circulation, and gra-
dually fill the empty vessels.

If, in time of flooding, the is seized with labour-pains,
or if, by every now and then stretching with your fingers
the os internum, you bring on labour, by which either
the membranes or head of the child is pulled down; and
opens the os internum, the membranes ought to be
broke; so that some of the waters discharging, the
uterus may contract and squeeze down the foetus. This
may be done sooner in those women who have had chil-
dren formerly. If, notwithstanding this expedient, the
flooding still continues, and the child is not like to be
soon delivered, it must be turned immediately; or, if the
head is in the pelvis, delivered with the forceps: but, if
neither of these two methods will succeed, on account of the
narrowness of the pelvis, or the bigness of the head, this
last must be opened and delivered with the crotchet. In
all these cases, let the parts be dilated slowly and by in-
tervals, in order to prevent laceration. See Plate CXI,
fig. 4. 5. 6.

The third class of Preternatural Labours.

We have already observed, that the principal difficulti-
ties in turning children and bringing them by the feet,
proceeded from the contraction of the uterus and bad
position of the foetus. If the child lies in a round form,
whether the fore-parts are towards the os internum, or
up to the fundus uteri, we can, for the most part, move
it with the hand, so as to turn the head and shoulders to
the upper part, and the breech and legs downwards; but
if the child lies lengthways, the womb being contracted
around it, like a long sheath, the task is more difficult;
especially, if the head and shoulders of the child are
down at the lowest part of the uterus, with the breech
and feet turned up to the fundus.

The hand of the operator being introduced into the ut-
terus, if he finds the breech below the head and shoul-
ders, let him search for the legs, and bring them down: but
if the breech be higher than the upper parts of the child,
or equal with them, he must try to turn the head and
shoulders to the fundus, and the breech downwards, by
pulling up the first, and pulling down the last; then pro-
ceed with delivery as before directed. This is commonly
executed with care, provided some part of the waters still
remain in the uterus; but, if the woman has been long
in labour, and the waters discharged, the contraction of the
womb is so strong, that the child cannot be turned
without the exertion of great force frequently repeated.
In this case, the easiest method both for the patient and
operator, is to pull up the hand gradually on that side to
which the legs and thighs are turned; and even after he
has reached them, if they are not very high up, let him
advance his hand as far as the fundus uteri; he will thus
remove the greatest obstacle, by enlarging the cavity of the
womb, so as more easily to feel and bring down the legs:
then he may pull up and pull down, as we have pre-
scribed above; but, if the head and shoulders still continue
to hinder the breech and body from coming along, and
the feet cannot be brought so low, as the outside of the
os externum, while they are yet in the vagina he may
apply a noose upon one or both; for unless the child is so
small that he can turn it round by grasping the body when
the head and shoulders are pushed up, and he endeavours
to bring down the other part, they will again return to the
same place, and retard delivery: whereas, if he gains a firm
hold of the feet, either without the os externum, or in the
vagina, by means of the noose fixed upon the ankles, he can
with the other hand pull up the head and shoulder, and be
able in that manner to bring down the breech. He must con-
tinue this method of pulling up and pulling down, until
the head and shoulder are raised to the fundus uteri; for
should he leave off too soon, and withdraw his hand, al-
though the child is extracted as far as the breech, the
head is sometimes so prefixed down and engaged with the
body in the passage, that it cannot be brought farther
down without being tore along with the crotchet; for the
breech and part of the body may block up the passage in
such a manner, as that the hand cannot be introduced to
raise the head.

Those cases are commonly the easiest in which the fore-
parts present, and the child lies in a round or oval form,
across the uterus, or diagonally, when the head or breech
is above and over the os pubis, with the legs, arms, and
navel-string, or one or all of them, at the upper or lower
part of the vagina, or on the outside of the os externum.
Those are more difficult in which, though the child lies
in the same round or contracted form, the back, shoul-
ders, belly, or breech, are over the os internum; because if
we cannot move the child round, so as to place the head
to the fundus, the legs are brought down with much more
difficulty than in the other cases: but if the shoulder,
breast, neck, ear, face, or crown of the head presents, and
the legs and breech are up to the fundus uteri, the case
is still more difficult; because, in the other two, the ut-
erus is contracted in a round form, so that the wrong
position of the child is more easily altered than in this,
when the womb is contracted in a long shape, and some-
times requires vast force to stretch it, so as that the head
may be raised to the fundus, and the legs and breech
brought down.

The crown of the head is the worst part that can pre-
cent, because in that case the feet and breech are higher,
and the uterus of a longer form than in any other. The
presentation of the face is, next to this, attended with the
greatest difficulty: but when the neck, shoulder, back, or
breech present, the head is turned upwards, and keeps the
lower part of the womb dilated: so that, upon stretch-
ing the upper part, the child's head is more easily raised
to the fundus.

When the fore-parts of the child present, if the feet,
hands, and navel-string are not detained above the os ut-
eri, some or all of them descend into the vagina, or ap-
ppear on the outside of the os externum. If one or more
of them come down, and the child at the same time lies
in a round form across the uterus, let the accoucheur in-
troduce his hand between them and the facrum. When it
is past the os internum, let it rest a little, while he feels
with his fingers the position of the focus: if the head
and shoulders lie higher than the breech, he must take
hold of the legs and bring them down without the os
internum:
internum: if the breech is detained above the brim of the pelvis, let him slide up the flat of his hand along the buttocks, and pull down the legs with the other hand, by which method the breech is disengaged and forced into the middle of the pelvis. See Plate CXIII. fig. 3.

In most of these cases where the child is pressed in an oval form, if neither the head or breech present, the head is to one side of the uterus, and the breech to the other; because it is wider from side to side, than from the back to the fore part; and if either the head or breech is over the os pubis, the other is turned off to the side: in moving the head or shoulders to the fundus, they are raised with greater ease along the side, than at the back or fore parts, for the same reasons.

If the head and shoulders lie lower down, so as to hinder the breech from coming along, and the legs from being extracted, let him pull up the head and shoulders to the fundus, and pull out the legs; then try to bring in the breech; and if it still sticks above, because the head and shoulders are again forced down by the contraction of the uterus, he must with one hand take hold of the legs that are now without the os externum, and, sliding the other into the uterus, pull the head and shoulders again up to the fundus, while, at the same time, he pulls the legs and breech along with the feet. If the legs cannot be brought farther down than the vagina, because the breech is high up, let him flip a noose over the feet round the ancles, as before observed; by which he may pull down the lower parts with one hand, while the other is employed in pushing up, as before. By this double purchase, the child may be turned even in the most difficult cases: but the operator, in pulling, must beware of overstraining the ligaments of the joints.

If the legs can be extracted through the os externum, let a single cloth, warmed, be wrapped round them, in order to yield a firmer hold to the accoucheur; but when they can be brought no lower than the neck of the uterus and vagina, he may use one of these following nooses.

Let him take a strong limber fillet, or soft garter half-worn, about one yard and a half in length, and moderately broad and thick; if thick, an eye may be made at one end of it, by doubling about two inches and sewing it strongly; and the other end passed through this doubling, in order to make the noose; which being mounted upon the thumb and fingers of his hand, must be introduced, and gently slipped over the toes and feet of the child so as to embrace the ancles, and thus applied it must be drawn tight with his other hand.

If the foot or feet should be too slippery, that his fingers cannot hold them, and work over the noose at the same time, it must be withdrawn and mounted round his hand or wrist; with which hand, when introduced, he may take firm hold on both feet, if they are as far down as the vagina; then with the fingers of his other hand, he can slide the noose along the hand and fingers that hold the feet, and fix it round the ancle: but if one foot remains within the uterus, the fingers of his other hand cannot pull up the noose far enough to slide it over the ancle; so that he must have recourse to a director, like that for polypules, mounted with the noose, which will pull it along the hand and fingers that hold the foot. The noose being thus slipped over the fingers upon the ancle, he must pull the extremity of the fillet which hath passed the eye at the upper end of the director, and after it is close drawn, bring down the instrument.

If the fillet or garter is too narrow or thin, let it be doubled in the middle, and the noose made by pulling the two ends through the doubling.

When the belly presents, and the head, shoulders, breech, thighs, and legs, are turned up over the back to the fundus uteri; when the back presents, and all these parts are upwards; when the side presents, with the head, shoulders, breech, thighs and legs turned to the side, back, or fore part of the uterus: in all these cases, when the child is pressed into a round, or (more properly) an oval figure, it may be, for the most part, moved round, with one hand introduced into the uterus, the head and shoulders pushed to the fundus, and the legs and breech to the os internum; which being effected, the legs are easily brought down. See Plate CXIII. fig. 4. But these cases are more or less difficult as the feet are farther up, or lower down, because the business is to bring them downwards.

When the breath, shoulders, neck, ear, or face presents to the os internum, the breech, thighs, and legs being towards the fundus, with the fore parts of the foetus turned either to the side, back, or fore-part of the woman's belly; and the whole lying in a longish form, the uterus being closely contracted around its body like a sheath; let the accoucheur introduce his hand into the vagina, and open the os internum by pulling up the fingers and hand flattened between the parts that present and the inside of the membranes; and rett his hand in that situation, until he can distinguish how the child lies, and form a right judgment how to turn and deliver; for, if these circumstances are not maturely considered, he will begin to work in a confused manner, fatigue himself and the patient, and find great difficulty in turning and extracting the child.

If the feet and legs of the foetus lie towards the back, sides, or fundus uteri, the woman ought to be laid on her back, with her breech raised and brought a little over the bed, as formerly observed; because, in that position he can more easily reach the feet than in any other.

If they lie towards the fore-part of the uterus, especially when the belly is pendulous, she ought to lie upon her side; because in the other posture, it is often difficult to turn the hand up to the fore-part of the womb; whereas, if she is laid on the left side, the right hand may be introduced at the upper part and left side of the brim of the pelvis, where it is widest, and then along the fore-part of the uterus, by which means the feet are more easily come at. If it is more convenient for the accoucheur to use his left hand, the patient may be turned on her right side. The only inconvenience attending these positions, is, that the woman cannot be kept so firm and steady, but will be apt to roll about and shrink from the operator: besides, there may be a necessity for turning her upon her back, after the body is delivered, before he can extract the head, especially if it be large, or the pelvis narrow.

The situation of the child being known, and the position of
of the uterus, and obtain a freer scope to bring them down to the lower part, and pass it up again on the outside of such incumbrance.

The hand being advanced as high as the fundus, let him, after some pause, feel for the breech, slide his fingers along the thighs in search of the legs and feet; of which taking hold with his whole hand, if possible, let him bring them down either in a straight line or with a half turn: or should the contraction of the uterus be so strong, that he cannot take hold of them in that manner, let him seize one or both ankles between his fingers, and pull them along; but if he cannot bring them down to the lower part of the uterus, fo as to apply the noose, he must try again to pull up the body, in order still more to stretch the uterus; for the presenting part cannot be raised up, or, though pulled upwards, immediately returns before the legs can be properly seized or brought down; the operator ought, in that case, to force up his hand slowly and gradually between the uterus and the child: if the resistance is great, let him ret a little, between whiles, in order to save the strength of his hand and arm, and then proceed with his efforts until he shall advance his hand as far as the feet; for the higher his hand is pulled, the more will the uterus be stretched, and the more room granted for bringing the legs along: and if, in pulling up his hand, the fingers should be entangled in the navel string or one of the arms, let him bring it a little lower, and pass it up again on the outside of such incumbrance. The hand being advanced as high as the fundus, let him, after some pause, feel for the breech, slide his fingers along the thighs in search of the legs and feet; of which taking hold with his whole hand, if possible, let him bring them down either in a straight line or with a half turn: or should the contraction of the uterus be so strong, that he cannot take hold of them in that manner, let him seize one or both ankles between his fingers, and pull them along; but if he cannot bring them down to the lower part of the uterus, fo as to apply the noose, he must try again to pull up the body, in order still more to stretch the uterus, and obtain a freer scope to bring them down to the lower part, and pass it up again on the outside of such incumbrance.

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If one leg only can be brought down, the child being turned, and that member extracted through the os externum, let the accoucheur slide his hand up to fetch the other; but, if this cannot be done, he must fix a finger on the outside of the groin of that thigh which is folded along the belly, and bring along that buttock, as in the breech cafe, while he pulls with his other hand at the other leg; and the body being thus advanced, deliver as before directed.

When the shoulder presents, and the arm lies double in the vagina, let him pull them both up; but, if this cannot be done, and the hand is prevented from passing along, he must bring down the arm, and hold it with one hand, while the other hand is introduced; then let go and pull up the shoulder, and as the child is turned, and the feet brought down, the arm will for the most part return into the uterus: but, if the arm that is come down, be so much swelled, that it is impracticable to introduce the hand, fo as to turn and deliver the child, he must separate it at the joint of the shoulder, if it be so low down; or at the elbow, if he cannot reach the shoulder. If the limb be much mortified, it may be twisted off; otherwise, it may be snip and separated with the scissors.

If the shoulder, by the imprudence and ignorance of the unskilful, who pull, in expectation of delivering in that way, is forced into the vagina, and part of it appears on the outside of the os externum, a vast force is required to return it into the uterus; because, in this case, the shoulder, part of the ribs, breast, and side, are already pulled out of the uterus, which must be extended fo as not only to receive them again, but also to admit the hand and arm of the accoucheur. If this detention cannot possibly be effected, he must fix a crotchet above the sternum, and turn the child by pulling up the shoulder and pulling down with the crotchet; or slide his fingers to the neck of the child, and with the scissors divide the head from the body; then deliver first the separated head, or bring along the body by pulling at the arm, or, if need be, with the assistance of the crotchet.

When the forehead, face, or ear presents, and cannot be altered with the hand into the natural position; or is not advanced to the os externum, as that we can affist with the forceps; the head must be returned, and the child delivered by the feet: but if this cannot be done, and the woman is in imminent danger, recourse must be had to the crotchet.

If the navel-string comes down by the child's head, and the pulsation is felt in the arteries, there is a necessity for turning without loss of time; for unless the head advances fast, and the delivery is quick, the circulation in the vessels will be entirely obstructed, and the child consequently perish. If the head is low in the pelvis, the forceps may be successfully used.

No doubt, if the pelvis is very narrow, or the head too large, it would be wrong to turn: in that case, we ought to try if we can possibly raise the head, so as to reduce the funis above it, and after that let the labour go on: but, if the waters are all gone, and a large portion of the funis falls down, it is impossible to raise it, so as to keep it up, even although we could easily raise the head; because, as one part of the funis is pulled up with the fingers, another part falls down, and eradates the reduction; and to raise it up to the side, and not above the head, will be to no purpose; when a little only jets down at the side of the head, our endeavours will, for the most part, be useless.

The ancients, as well as some of the moderns, advise, in all cases when the upper parts, such as the shoulders, breast, neck, face, or ear of the child present, to pull them upwards, and bring in the head as in the natural way; observing, that the fetus ought never to be delivered by the feet, except in the presentation of the lower parts, such as the small of the back, belly, side, breech, or legs. Were it practicable at all times to bring the head into the right position, a great deal of fatigue would be saved to the operator, much pain to the woman, and imminent danger to the child: he therefore ought to attempt this method, and may succeed when he is called before the membranes are broke, and feels, by the touch, that the face, ear, or any of the upper parts, present; in that case, let him open the os externum slowly during every pain, and when the os internum is sufficiently dilated by the descent of the waters and membranes, let him introduce his hand into the uterus, as before directed, betwixt the womb and the membranes, which must be broke;
provided the thighs are strongly pressed against the funis by the feet. This we cannot promise after the head is brought in; and once the operator's hand is in the uterus, he ought not to run such risks. The child's head, which will, of consequence, come along with the parts that hindered the head from presenting are again forced down: besides, the head is so large and slippery, that he can obtain no firm hold. He might, indeed, by introducing a finger into the mouth, lay hold of the under jaw, and bring in the face, provided the child's head, upon the upper part of which the neck and shoulders, then pull along. The crotchets, if it be detained by the size of the belly, as to stop the circulation in the rope; as also when the child is detained by the head, after the body is delivered: in both cases, the danger must be obviated by an expeditious delivery; and if the body is delivered in the navel-string, it must be disengaged as well as possible, especially when the funis happens to be between the thighs. The legs and breech of the child being brought down, and the body properly turned with the fore-parts to the mother's back, let the accoucheur endeavour to bring it along; but, if it is detached by the fize of the belly, distended with air or water, (a case that frequently happens when the head has been dead for several days,) let the belly be opened, by forcing into it the points of his scissors; or, he may tear it open with the sharp crotchets.

The body of the child being delivered, the arms brought down, and every method hitherto directed unsuccessfully used for the extraction of the head, which is detained by being naturally too large, over ossified, or dropping, or from the narrowness and distorsion of the pelvis; if the belly was not opened, and the child is found to be alive by the motion of the heart, or pulsation of the arteries in the funis, the forceps ought to be tried; but, if he finds it impracticable to deliver the head, so as to save the life of the child, he must, according to some, force the points of the scissors through the lower part of the occipital bone, or through the foramen magnum; then dilate the blades, so as to enlarge the opening, and introduce a blunt or sharp hook. This operation rarely succeeds when the head is over-ossified; but may answer the purpose when the bones are soft and yielding; or in the case of an hydrocephalus: because, in the first, the aperture may sometimes be enlarged, and in the other the water will be evacuated so as to diminish the bulk of the head, which will, of consequence, come along with more ease.

If, notwithstanding these endeavours, the head cannot be extracted, let the operator introduce his hand along the head, and his fingers through the os uteri; then slide up one of the curved crotchets along the ear, between his hand and the child's head, upon the upper part of which it must be fixed; this being done, let him withdraw his hand, take hold of the instrument with one hand, turning the curve of it over the forehead, and with the other grasp the neck and shoulders, then pull along. The crotchets being thus fixed on the upper part, where the bones are thin and yielding, makes a large opening, through which the contents of the skull are emptied, the head collapsing is more certain extracted, and the instrument hath a firm hold to the last, at the forehead, os petrosum, and basin of the skull.

The excellency of Mesnard's contrivance is more conspicuous here than when the head presents; because the curvature of the crotchet allows the point to be fixed on the upper part of the skull, which is to be tore open; and in pulling, the contents are evacuated, and the head is leftened: by these means, the principal obstruction is removed. See Plate CXIII. fig. 8.

a, Reprefents a pair of curved crotchets locked together in the same manner as the forceps. The dotted lines along the inside of one of the blades represent a sheath contrived to guard the point till it is intro-

b, The child is often in danger, and sometimes lost, when the breech presents, and is low down in the pelvis, provided the thighs are strongly pressed against the funis
... practitioner, who not knowing how to turn the fore parts the fetus, destroys the structure of the brain, and ex-
man's belly with both hands, in order to keep the uterus
lock and join them together, and pull along, moving and
body is much mortified, even though he hath used all the
when the child hath been dead for many days, and the
hind. This may also happen to an expert accoucheur,
position, pull at random with all their strength; so that
or how to bring it along, although it presented in that
pelvis: let him direct an assistant to press upon the wo-
... of the head; then withdrawing the hand which was in-
the pelvis, and introducing two fingers into the mouth,
needed or size of the head, or the nar-
extraordinarily obstinate, or size of the head, or the nar-
less and distortion of the pelvis, after having used the
without success, he must separate the body from the
head with a bifurcated or pair of scissors; then pulling
up the head into the uterine, turn the face to the fundus,
and the vertex down to the os internum and brim of the
pelvis: let him direct an assistant to press upon the woman's belly with both hands, in order to keep the uterus
and head firm in that position; then open the skull with
wielding the scissors, destroy the structure of the brain, and ex-
tract with the crotchets.

The head is sometimes left in the uterus by those practitioners, who not knowing how to turn the fore parts
and face of the child towards the back part of the uterus,
or how to bring it along, although it preferred in that
position, pull at random with all their strength; so that
the neck is stretched and separated, and the head left behind. This may also happen to an expert accoucheur,
when the child hath been dead for many days, and the
body is much mortified, even though he hath used all the necessary precautions.

In such a case, provided the head is not very large,
or the pelvis narrow, and the forehead is towards the
facrum, let him slide up his hand along the back part
of the pelvis, and introducing two fingers into the mouth,
with the thumb below the chin, try to pull the head into the
hollow of the facrum: if it sticks at the setting-in of that bone, he must endeavour to move it, first to one
side, and then to the other. If the head is small, it will
come along; if any fragment of the neck remains, or any
part of the loose skin, he may lay hold on it, and assist
delivery, by pulling at it with his other hand; if the head
is low down, it may be extracted with the forceps.

Should all these methods fail, let him pull up his hand
along the side of the head, until it shall have passed the
os internum; with the other hand, let him introduce one
of the curved crotchets, and fix it upon the upper part
of the head; then withdrawing the hand which was intro-
duced, take hold on the instrument, and sliding the
fingers of the other hand into the mouth, he must pull
down with both, as above directed. If the head is not
over-offixed, the crotchets will tear open the skull; and
the bulk being of consequence diminished, the whole may
be brought along, even in a narrow pelvis: but if it can-
ot be moved, even by this expedient, he must introduce
the other crotchets along the other side of the head, and
fixing it upon the skull, lock them together; then in
pulling, turn the fore-head down into the hollow of the
facrum, and extract with an half round turn upwards, as
when delivering with the forceps.

If the forehead is towards the os pubis, and cannot be
brought into the right position, let him with his hand
push up the head into the uterus, turn the forehead from
the anterior to the side or back part of it, and try to ex-
tract as before. If the child hath been dead some time,
and is much mortified, he must pull cautiously at the un-
der jaw, because, should that give way, he will have no
other hold for pulling, or keeping the head steady when
he attempts to extract with one crotchets.

When the head is so large, or the pelvis so narrow,
that none of these methods will succeed, let him push up,
and turning the upper parts downwards, direct an assistant
to press the patient's belly with both hands, moving them
from side to side, and squeezing in such a direction as
will force the head towards the os internum, and retain
it firmly in that position; then it must be opened and ex-
tracted.

Although, by these means, you may succeed in a few
cases of this kind, yet as great difficulties may occur from
inflammations of the pudenda, contraction of the uterus,
flipperness or largeness of the head, and the narrowness
of the pelvis, it will not be improper to inform the reader
of other methods that appear to be useful. Let the
hand be introduced into the vagina, and if it cannot be
admitted within the uterus, the fingers being infinuated,
may move the head so as to raise the face and chin to the
fundus, the vertex being turned to the os internum, and
the forehead towards the side of the facrum. This being
effected, let the operator slide up along one ear a blade
of the long forceps, which are curved to the side; then
change hands, and fend up the other blade along the op-
opposite ear: when they are locked, and the handles secu-
red by a fillet, he must pull the head so low as it will
come; then putting them into the hands of an assistant,
who will keep them in that position, let him make a
large opening with the scissors, squeeze the head with
great force, and extract slowly and by degrees.

Having turned down the vertex, as above directed, let
Leveret's tire tête, with the three sides joined together,
be introduced along the accoucheur's hand to the upper
part of the head; then let the sides or blades be opened
with the other hand, so as to incline the head, moving
them circularly and lengthwise in a light and easy man-
ner, that they may pass over the inequalities of the scalp,
and avoid the refistance of the head and uterus: when
they are exactly placed at equal distances from one an-
other, let him join the handles, withdraw his hand, and
ty them together with a fillet, pull down, open, and
extract, as above directed; and let it be remembered,
that the farther the hand can be introduced into the uter-
us, the more easily will both instruments be managed.

When
When the pelvis is large, or the head small, (in which cases this misfortune seldom happens,) without doubt we might succeed with Mauriceau's broad fillet or sling, provided it could be properly applied.

When the head is small, or the pelvis large, dilating the foremen magnum with the scissors; and introducing the blunt hook, may be of use either to pull the head along, or keep it down until we can fix the forceps, curve crotchet, or Leveret's tire-tête.

Of Twins.

Twin's are supposed to be the effect of a double conception in one cirition, when two or more ova are impregnated with as many animalcula; which descending from the ovarium, through the Fallopian tube, into the fundus uteri, as they increase, come in contact with that part, and with one another, and are so prefixed as to form one globular figure, and stretch the womb into the same form which it assumes when distended by one ovum only; and that during the whole term of uterine gestation, it is impossible to distinguish twins, either by the figure and magnitude of the uterus, or by the motion of the different fetuses; for one child, when it is large, and surrounded with a great quantity of waters, will sometimes produce as large a prominence (or even larger) in the woman's belly, than is commonly observed when she is big with twins. One child will also, by moving its legs, arms, and other parts of its body, against different parts of the uterus, at the same instant, or by intervals, yield the same sensation to the mother, as may be observed in two or more children; for part of the motion in twins is employed on each other, as well as upon the uterus.

There is therefore no certain method of distinguishing in these cases, until the first child is delivered, and the accoucheur has examined if the placenta is coming along. If this comes of itself, and after its extraction the mouth of the womb be felt contracted, and the operator is unwilling to give unnecessary pain by introducing his hand into the uterus; let him lay his hand upon the woman's abdomen, and if nothing is left in the womb, he will generally feel it just above the os pubis, contracted into a firm round ball of the size of a child's head, or less: whereas, if there is another child left, the fize will be found much larger. If the placenta does not come down before the second child, which is frequently the case, upon examining, he will commonly feel the membranes with the waters pushed down through the os uteri; or, if they are broke, the head or some part of the body will be felt. If, therefore, the woman has strong pains, and is in no danger from flooding or weakness, provided the head presents fair, and seems to come along, she will be delivered of this also in the natural way.

If the membranes are not broke, if the head does not immediately follow, or if the child presents wrong, he ought to turn and bring it immediately by the feet; in order to save the patient the fatigue of a second labour, that may prove tedious, and even dangerous, by enfeeling her too much. Besides, as the parts are fully opened by the first delivery, he can introduce his hand with ease; and as the membranes are, for the most part, whole, the waters may be kept up, and the fetus easily turned; but, if the pelvis is narrow, the woman strong, and the head presents, he ought to leave it to the efforts of nature.

If the child presents wrong, and, in turning that, he finds another, he must beware of breaking the membranes of one, while he is at work upon the other: but, should they chance to be broke, and the legs of both entangled together, (though this is seldom the case, because they are commonly divided by two sets of membranes,) let the operator, when he has got hold on two legs, run up his fingers to the breech, and feel if they belong to the same body: and one child being delivered, let the other be turned and brought out in the same manner. If there are more than two, the same method must take place, in extracting one after another.

In case of twins, the placenta of the first child is delivered; but, as this does not always happen, he ought, as formerly directed, to certify himself that there is nothing left in the uterus, when the cake comes of itself. Both children being delivered, let him extract both placentas, if they come not of themselves; and if they form distinct cakes, separate first one, then the other; but if they are joined together, forming but one mass, they may be delivered at once.

When there are three or four children, (a case that rarely happens,) the placentas are sometimes distinct, and sometimes all together form but one round cake; but, when this is macerated in water for some days, they, with their several membranes, may be easily separated from one another; for they only adhere in consequence of their long pressure in the uterus, and seldom have any communication of vessels.

Twins for the most part lie diagonally in the uterus, one below the other; so that they seldom obstruct one another at the os internum. See Plate CXL. fig. 5.

Of Monsters.

Two children joined together by their bellies, (which is the most common cafe of monstrous births,) or by the sides, or when the belly of one adheres to the back of the other, having commonly but one funis, are comprehended in this class, and supposed to be the effect of two animalcula impregnating the same ovum, in which they grow together, and are nourished by one navel-string, originally belonging to the funis; because, the vessels pertaining to the coats of the vein and arteries, do not anastomose with the vessels belonging to the funus.

In such a case, where the children were small, the adhesion hath been known to stretch in pulling at the feet of one, so as to be delivered; and the other hath been afterwards brought along, in the same manner, without the necessity of a separation.

When the accoucheur is called to a case of this kind, if the children are large, and the woman come to her full time, let him first attempt to deliver them by that method; but if, after the legs and part of the body of the first are brought down, the reef will not follow, let him slip up his hand, and with his fingers examine the adhesion; then introducing the scissors between his hand and the body of the fetus, endeavour to separate them by snipping.
snipping through the juncture. Should this attempt fail, he must diminish the bulk in the best manner he can think of, and bring the body of the first, in different pieces, by pulling or cutting them asunder, as he extracts with the help of the crotchet.

No certain rules can be laid down in these cases, which seldom happen; and therefore a great deal must be left to the judgment and sagacity of the operator, who must regulate his conduct according to the circumstances of the case, and according to the directions given for delivering, when the pelvis is narrow and the children extraordinary large.

Of the CEASARIAN OPERATION.

When a woman cannot be delivered by any of the means hitherto described and recommended in laborious and preternatural labours, on account of the narrowness or distortion of the pelvis, into which it is sometimes impossible to introduce the hand; or from large excrescences and glandular swellings, that fill up the vagina, and cannot be removed; or from large cicatrices and adhesions in that part, and at the os uteri, which cannot be separated; in such emergencies, if the woman is strong, and of a good habit of body, the Cæsarian operation is certainly advisable, and ought to be performed; because the mother and child have no other chance to be saved, and it is better to have recourse to an operation which hath sometimes succeeded, than leave them both to inevitable death. Nevertheless, if the woman is weak, exhausted with fruitless labour, violent floodings, or any other evacuation, which renders her recovery doubtful, even if she were delivered in the natural way: in these circumstances it would be rashness and presumption to attempt an operation of this kind, which ought to be delayed until the woman expires, and then immediately performed, with a view to save the child.

The operation hath been performed both in this and the last century, and sometimes with such success, that the mother has recovered, and the child survived. The previous steps to be taken, are to strengthen the patient, if weak, with nourishing broths and cordials; to evacuate the indurated faces with repeated glycyfers; and, if the bladder is distended with urine, to draw it off with a catheter. These precautions being taken, she must be laid on her back, on a couch or bed, her side on which the incision is to be made being raised up by pillows placed below the opposite side: the operation may be performed on either side, though the left is commonly preferred to the right; because, in this last, the liver extends lower. The apparatus consists of a bistoury, probe-scissors, large needles threaded, sponges, warm water, pledgets, a large tent or doffil, compresses, and a bandage for the belly.

If the weather is cold, the patient must be kept warm, and no part of the belly uncovered, except that on which the incision is to be made: if the operator be a young practitioner, the place may be marked by drawing a line along the middle space between the navel and the os ilium, about six or seven inches in length, slanting forwards towards the left groin, and beginning as high as the navel.

According to this direction, let him hold the skin of the abdomen tense between the finger and thumb of one hand, and, with the bistoury in the other, make a longitudinal incision through the cutis, to the membranes adnalis, which, with the muscles, must be slowly dissected and separated, until he reaches the peritonæum, which must be divided very cautiously, for fear of wounding the intestines that frequently flap out at the sides, especially if the membranes are broke, the waters discharged, and the uterus contracted.

The peritonæum being laid bare, it may either be pinched up by the fingers, or slowly dissected with the bistoury, until an opening is made sufficient to admit the fore-finger, which must be introduced as a director for the bistoury or scissors in making an effectual dilatation. If the intestines push out, let them be pressed downwards, so as that the uterus may come in contact with the opening. If the womb is still distended with the waters, and at some distance from the child, the operator may make upon it a longitudinal incision at once; but if it is contracted close round the body of the fetus, he must pinch it up, and dilate in the same cautious manner practiced upon the peritonæum, taking care to avoid wounding the Fallopian tubes, ligaments, and bladder: then introducing his hand, he may take out the child and secundines.

If the woman is strong, the uterus immediately contracts, so as that the opening, which at first extended to about six or seven inches, is reduced to two, or less; and in consequence of this contraction, the vessels being shrunk up, a great effusion of blood is prevented.

The coagulated blood being removed, and what is still fluid spunged up, the incision in the abdomen must be stitched with the interrupted stitch, and sufficient room left between the last stitch and the lower end of the opening, for the discharge of the moisture and extravasated fluid. The wound may be dressed with dry pledgets or doffils dipped in some liquid balsam warmed, covered with compresses moistened with wine, and a bandage to keep on the dressings and axle the belly. Some authors observe, that the cuts and muscles only should be taken up in the future, left bad symptoms should arise from stitching the peritonæum.

The woman must be kept in bed, as quiet as possible, and every thing administered to promote the lochial, perspiration, and sleep: which will prevent a fever and other dangerous symptoms. If she hath lost a great quantity of blood from the wounds in the uterus and abdomen, so as to be in danger from inanition, broths, caudles, and wine, ought to be given in small quantities, and frequently repeated; and the Peruvian bark administered in powder, decoction, or extract, may be of great service in this case.

Of the management of women from the time of their delivery to the end of the month, with the several diseases to which they are subject during that period.

Of the EXTERNAL APPLICATION.

The woman being delivered of the child and placenta, let a soft linen cloth, warmed, be applied to the external parts; and if she complains much of a smarting fores, some pomatum may be spread upon it. The linen that
that was laid below her, to sponge up the discharges, must be removed, and replaced with others that are clean, dry, and warm. Let her lie on her back, with her legs extended close to each other; or upon her side, if she thinks she can lie easier in that position, until the recoveries from the fatigue: if she is spent and exhausted, let her take a little warm wine or caudle, or, according to the common custom, some nutmeg and sugar grated together dry, and a warm. Let her lie on her back, with her legs replaced with others that are clean, and not be removed; and replaced with others that are clean, press the vifeera and the relaxed parietes of the abdomen, pinned moderately tight over the cloth, in order to compress the vifeera and the relaxed parietes of the abdomen, or those applied in their room; and, if there be a large discharge from the uterus, let the wet linen below her be also shifted, that she may not run the risque of catching cold.

When the patient is either weak or faint, she ought not to be taken out of bed, or even raised up to have her head and body thitred, until she is a little recruited; otherwise it will be in danger of repeated faintings, attended with convulsions, which sometimes end in death.

To prevent these bad consequences, her skirt and petticoats ought to be loosed and pulled down over the legs, and replaced by another well warmed, with a broad headband to be flit in below, and brought upon her thighs and hips: a warm double cloth must be laid on the belly, which is to be surrounded by the head band of the skirt pinned moderately tight over the cloth, in order to compress the vifeera and the relaxed parietes of the abdomen, or more or less, as the woman can easily bear it; by which means the uterus is kept firm in the lower part of the abdomen, and prevented from rolling from side to side when the patient is turned: but the principal end of this compression, is to hinder too great a quantity of blood from rushing into the relaxed vessels of the abdominal contents; especially when the uterus is emptied all at once, in a quick delivery. The pressure being thus suddenly removed, the head is all at once robbed of its proportion of blood, and the immediate revolution precipitates the patient into dangerous lyphothymia.

Retention and Excretion, and the Passions of the Mind.

Although we cannot remove the patient immediately after delivery into another climate, we can qualify the air, so as to keep it in a moderate and salutary temper, by rendering it warm or cold, moist or dry, according to the circumstances of the occasion. With regard to dry, women in time of labour, and even till the ninth day after delivery, ought to eat little solid food, and none at all during the first five or seven: let them drink plentifully of warm diluting fluids, such as barley water, gruel, chicken water, and tea; caudles are also commonly used, composed of water gruel boiled up with mace and cinnamon, to which, when strained, is added a third or fourth part of white wine, or else, if the patient drinks plentifully, sweetened with sugar to their taste: this composition is termed white caudle; whereas, if ale is used instead of wine, it goes under the name of brown caudle. In some countries, eggs are added to both kinds; but, in that case, the woman is not permitted to eat meat or broths till after the fifth or seventh day: in this country, however, as eggs are no part of the ingredients, the patient is indulged with weak broth sooner, and sometimes allowed to eat a little boiled chicken. But all these different preparations are to be prescribed weaker or stronger, with regard to the spices, wine, or ale, according to the different constitutions and situations of different patients: for example, if she is low and weak, in consequence of an extraordinary discharge of any kind, either before or after delivery, or if the weather is cold, the caudles and broths may be made the stronger; but, if she is of a full habit of body, and has the least tendency to a fever, or if the season is excessively hot, these drinks ought to be of a very weak confidence, or the patient restricted to gruel, tea, barley and chicken water, and these varied according to the emergency of the case.

Her food must be light and easy of digestion, such as panada, biscuit, and fago; about the fifth or seventh day she may eat a little boiled chicken, or the lightest kind of young meat: but, these last may be given sooner or later, according to the circumstances of the case, and the appetite of the patient. In the regimen as to eating and drinking, we should rather err on the abstemious side, than indulge the woman with meat and strong fermented liquors, even if these last should be most agreeable to her palate: for we find by experience, that they are apt to increase or bring on fevers, and that the most nourishing and salutary diet is that which we have above prescribed.

Every thing that is difficult of digestion, or quickens the circulating fluids, must of necessity promote a fever; by which, the necessary discharges are obstructed, and the patient’s life endangered.

As to the article of sleeping and watching, the patient must be kept as free from noise as possible, by covering the doors and stairs with carpets and cloths, oiling the hinges of the doors, silencing the bells, tying up the knockers, and in noisy streets throwing the pavement with straw; if, notwithstanding these precautions, she is disturbed, her ears must be stuffed with cotton, and opiates administered to procure sleep: because watching makes her restless, prevents perspiration, and promotes a fever.

Motion and rest are another part of the nonnaturals to which we ought to pay particular regard. By toiling about, getting out of bed, or sitting up too long, the perspiration is discouraged and interrupted; and in this last
at a fever: for the prevention of these bad symptoms, the
patient must be kept quiet in bed till the fourth or
fifth day, and then be gently lifted up in the bed-clothes,
in a lying posture, until the bed can be adjusted, into which
she must be immediately re-conveyed, there to continue
for the most part, till the ninth day, after which period
women are not to be subject to fevers, as immediately after
delivery. Some there are, who, from the nature of their
complaints, or other accidents, recover more slowly;
and such are to be treated with the same caution after,
as before, the ninth day, as the case seems to indicate:
others get up, walk about, and recover, in a much shorter
time; but these may some time or other pay dearly for
their foolhardiness, by encouraging dangerous fevers: so
that we ought rather to err on the safe side, than run
any risk whatsoever.

What next comes under consideration, is the circum-
stance of retention and excretion. We have formerly ob-
served, that in time of labour, before the head of the
child is locked into the pelvis, if the woman has not had
easy passage in her belly that same day, the rectum and
colon ought to be emptied by a glyster, which will affist
the labour, prevent the disagreeable excretion of the fec-
uses before the child's head, and enable the patient to re-
maintain two or three days after, without the necessity of
going to stool. However, should this precaution be ne-
lected, and the patient very coltive after delivery, we
must beware of throwing up stimulating glysters, or ad-
ministering strong cathartic, lest they should bring on too
many loose stools, which, if they cannot be stopped, som-
times produce fatal consequences, by obstructing the per-
spiration and lochia, and exhausting the woman, so as
that she will die of a sudden catastrophe, which hath
frequently happened from this practice. Wherefore, if
it be necessary to empty the intestines, we ought to pre-
scribe nothing but emollient glysters, or some very gentle
poultice, such as mustard or Elest. Levitatum. But no
excretion is of more consequence to the patient's recov-
ery, than a free perspiration; which is so absolutely ne-
cessary, that unless she has a moisture continually on the
surface of her body, for some days after the birth, the
fekion recovers to advantage; her health, therefore, in a
great measure depends upon her enjoying undisturbed
refpite, and a constant breathing sweat, which prevents a
fever, by carrying off the fection, and affists the equal
diffcharge of the lochia: and when these are obstructed,
and a fever ensues with pain and restlessness, nothing re-
lieves the patient so effectually as rest and profuse sweat-
ing, procured by opiates and sudorifics at the beginning
of the complaints; yet these last must be more cautious-
ly prescribed in excessive hot than in cool weather.

The last of the nonnaturals to be considered are the
sensations of the mind, which also require particular atten-
tion. The patient's imagination must not be disturbed by
the news of any extraordinary accident which may have
happened to her family or friends: for such information
hath been known to carry off the labour-pains entirely,
after they were begun, and the woman has sunk under her
dejection of spirits: and even after delivery, these un-
seasonable communications have produced such anxiety as
produce all the necessary excretions, and brought on a
violent fever and convulsions, that ended in death.

Of violent Floodings.

All women, when the placenta separates, and after
it is delivered, lose more or less red blood, from the
quantities of half a pound, to that of one pound, or even
two; but should it exceed this proportion, and continue
to flow without diminution, the patient is in great danger
of her life: this hazardous hemorrhage is known by the
violence of the discharge, wetting fresh cloths as fast as
they can be applied; from the pulse becoming low and
weak, and the countenance turning pale; then the ex-
tremities grow cold, the lips into faintings, and, if the
discharge is not speedily stopped, or diminished, is seized
with convulsions, which often terminate in death.

This dangerous efflux is occasioned by every thing that
hinders the emptied uterus from contracting, such as great
weakness and latitude, in consequence of repeated flood-
ings before delivery; the sudden evacuation of the ute-
rus; sometimes, though seldom, it proceeds from part
of the placenta's being left in the womb; it may happen
when there is another child, or more, still undelivered;
when the womb is kept dilated with a large quantity
of coagulated blood; or when it is inverted, by pulling
too forcibly at the placenta.

In this case, as there is no time to be lost, and inter-
\n
nal medicines cannot act so suddenly as to answer the pur-
pose, we must have immediate recourse to external appli-
cation. If the disorder be owing to weakness, by which
the uterus is disabled from contracting itself, so that the
mouths of the vessels are left open; or, though contracted
a little, yet not enough to restrain the hemorrhage of the
thin blood; or if, in separating the placenta, the accou-
cheur has scratched or tore the inner surface or mem-
brane of the womb; in these cases, such things must be
used as will assist the contractile power of the uterus, and
hinder the blood from flowing so fast into it and the neigh-
bouring vessels; for this purpose, cloths dipped in any
cold astringent fluid, such as oxycræte, or red tart wine,
may be applied to the back and belly. Some prescribe
venesection in the arm, to the amount of five or six ounces,
with a view of making resolution: if the pulse is strong,
this may be proper; otherwise, it will do more harm
than good. Others order ligatures, for compressing the
returning veins at the hams, arms, and neck, to retain as
much blood as possible in the extremities and head. Besid-es
these applications, the vagina may be filled with tow or
linen rags, dipped in the above-mentioned liquids, in
which a little allum, or salt, hath been dissolved; nay, some practitioners inject proof-spirits warmed, or,
foaking them up in a rag or sponge, introduce and squeeze
them into the uterus, in order to constringe the vessels.

If the flooding proceeds from another child, the reten-
tion of the placenta, or coagulated blood, these ought
immediately to be extracted; and if there is an inversion
of the uterus, it must be speedily reduced. Should the
hemorrhage, by these methods abate a little, but still
continue to flow, though not in such a quantity as to
bring on sudden death, some red wine and jelly ought to
be
be prescribed for the patient, who should take it frequently, and a little at a time; but above all things, chicken or mutton broths, administered in the same manner, for fear of overloading the weakened stomach, and occasioning re-chaings: these repeated in small quantities, will gradually fill the exhausted vessels, and keep up the circulation. If the pulse continues strong, it will be proper to order repeated draughts of barley-water, acidulated with elixir vitrii: but if the circulation be weak and languid, extract of the bark, dissolved in agua sinanom- mi tenuis, and given in small draughts, or exhibited in any other form, will be serviceable: at the same time, lulling the patient to rest with opiates. These, indeed, when the first violence of the flood is abated, if properly and cautiously used, are generally more effectual than any other medicine.

Of the After-pains.

After-pains commonly happen when the fibrous part of the blood is retained in the uterus or vagina, and formed into large clots, which are detained by the sudden contraction of the os internum and externum, after the placenta is delivered: or, if these should be extruded, others will sometimes be formed, though not so large as the first, because the cavity of the womb is continually diminishing after the birth. The uterus, in contracting, presses down these coagulums to the os internum; which being again gradually stretched, produces a degree of labour pains, owing to the irritation of its nerves: in consequence of this uneasiness, the woman squeezes the womb as in real labour: the force being increased, the clots are puffed along, and when they are delivered, the grows easy. The larger the quantity is of the coagulated blood, the fierer are the pains, and the longer they continue.

Women in the first child seldom have after-pains; because, after delivery, the womb is supposed to contract, and push off the clots with greater force in the first than in the following labours: after-pains may also proceed from obstructions in the vessels, and irritations at the os internum. In order to prevent or remove these pains, as soon as the placenta is separated and delivered, the hand being introduced into the uterus, may clear it of all the coagula. When the womb is felt through the parietes of the abdomen larger than usual, it may be taken for gran-ted, that there is either another child, or a large quantity of this clotted blood; and which, forever may be, there is a necessity for its being extracted. If the placenta comes away of itself, and the after-pains are violent, they may be alleviated and carried off by an opiate: for, by sleeping and sweating plentifully, the irritation is re-moved, the evacuations are increased, the os uteri is en-sensibly relaxed, and the coagula slide easily along. When the discharge of the lochia is small, the after-pains, if moderate, ought not to be restrained; because the squeezing which they occasion, promotes the other evacuation, which is necessary for the recovery of the patient. After pains may also proceed from an obstruction in some of the vessels, occasioning a small inflammation of the os internum and ligaments; and the squeezing thereby occasioned, may not only help to propel the obstructing fluid, but al-so (if not too violent) contribute to the natural discharges.

Of the Lochia.

We have already observed, that the delivery of the child and placenta is followed by an efflux of more or less blood, discharged from the uterus, which, by the immediate evacuation of the larger vessels, is allowed to contract itself the more freely, without the danger of an inflammation, which would probably happen in the contracto, if the great vessels were not emptied at the same time, but, as the fluids in the smaller vessels cannot be so soon evacuated, or returned into the vena cava, it is necessary, that, after the great discharge is abated, a flow and gradual evacuation should continue, until the womb shall be contracted to near the same size which it had before pregnancy; and to this it attains about the eighteenth or twentieth day after delivery, though the period is different in different women.

When the large vessels are emptied immediately after delivery, the discharge frequently ceases for several hours, until the fluids in the smaller vessels are propelled into the larger, and then begins to flow again, of a paler colour.

The red colour of the lochia commonly continues till the fifth day, though it is always turning more and more ferior from the beginning; but, about the fifth day, it flows off a clear, or sometimes (though seldom) of a greenish tint; for, the mouths of the vessels growing gradually narrower, by the contraction of the uterus, at last allow the ferior part only to pass: as for the greenish hue, it is supposed to proceed from a dissolution of the cellular or cribriform membrane or mucus, that surrounded the surface of the placenta and chorion; part of which, being left in the uterus, becomes livid, decays, and, dissolving, mixes with and tinctures the discharge as it passes along.

Though the lochia, as we have already observed, commonly continue to the eighteenth or twentieth day, they are every day diminishing in quantity, and soonest ceases in those women who suckle their children, or have had an extraordinary discharge at first; but the colour, quantity, and duration, differ in different women: in some patients, the red colour disappears on the first, or second day; and in others, though rarely, it continues more or less to the end of the month: the evacuation in some is very small, in others excessive: in one woman it ceases very soon, in another flows during the whole month: yet, all of these patients shall do well.

Some alledge, that this discharge from the uterus is the same with that from a wound of a large surface: but it is more reasonable to suppose, that the change of colour and diminution of quantity proceed from the flow contraction of the vessels; because, previous to pus, there must have been lacerations or impollhumes, and in women who have suddenly died after delivery no wound or excoriation hath appeared upon the inner surface of the womb, which is sometimes found altogether smooth, and at other times rough and unequal on that part to which the placenta adhered. The space that is occupied before delivery, from being nine inches in diameter, or eighteen inches in circumference, will, soon after the birth, be contracted to one third or fourfth of these dimensions.
Of the Milk Fever.

About the fourth day, the breasts generally begin to grow turgid and painful. We have formerly observed, that, during the time of uterine gestation, the breasts in most women gradually increase till the delivery, growing softer as they are enlarged by the vessels being more and more filled with fluids; and by this gradual distention they are prepared for secreting the milk from the blood, after delivery. During the two or three first days after parturition, especially when the woman has undergone a large discharge, the breasts have been sometimes observed to subside and grow flaccid; and about the third or fourth day, when the lochia begin to decrease, the breasts swell again to their former size, and stretch more and more, until the milk, being secreted, is either sucked by the child, or frequently of itself runs out at the nipples.

Most of the complaints incident to women after delivery, proceed either from the obstruction of the lochia in the uterus, or of the milk in the breasts, occasioned by any thing that will produce a fever; such as catching cold, long and severe labour, eating food that is hard of digestion, and drinking fluids that quicken the circulation of the blood in the large vessels; by which means the smaller, with all the secretory and excretory ducts, are obstructed.

The discharge of the lochia being so different in women of different constitutions, and besides in some measure depending upon the method of management, and the way of life peculiar to the patient, we are not to judge of her situation from the colour, quantity, and duration of them, but from the other symptoms that attend the discharge; and if the woman seems hearty, and in a fair way of recovery, nothing ought to be done with a view to augment or diminish the evacuation. If the discharge be greater than the can bear, it will be attended with all the symptoms of inanition; but as the lochia seldom flow so violently as to destroy the patient of a sudden, the may be supported by a proper nourishing diet, aflicted with cordial and restorative medicines. Let her, for example, use broths, jellies, and alleys milk; if the pulse is languid and sunk, she may take repeated doses of the confect. cardiae, with mixtures composed of the cordial waters and volatile spirits; sublastrigents and opiates frequently administered, with the cort. Peruvian, in different forms, and auffere wines, are of great service.

On the other hand, when the discharge is too small, or bath ceased altogether, the symptoms are more dangerous, and require the contrary method of cure: for now the business is to remove a too great plenitude of the vessels in and about the uterus, occafloning tension, pain, and labour, in the circulating fluids; from whence proceed great heat in the part, restlesness, fever, a full, hard, quick pulse, pains in the head and back, nausea, and difficulty in breathing. These complaints, if not at first prevented, or removed by rest and plentiful sweating, must be treated with venesection and the antiphlogistic method.

When the obstruction is recent, let the patient lie quiet, and encourage a plentiful diaphoresis, by drinking frequently of warm, weak, diluting fluids, such as water-gruel, barley-water, tea, or weak chicken-broth.

Should these methods be used without success, and the patient, far from being relieved by rest, plentiful sweating, or a sufficient discharge of the obstructed lochia, labour under an hot dry skin, anxiety, and a quick, hard, and full pulse, the warm diaphoretics must be laid aside; because, if they fail of having the desired effect, they must necessarily increase the fever and obstruction, and recourse be had to bleeding at the arm or ancle to more or less quantity, according to the degree of fever and obstruction; and this evacuation must be repeated as there is occasion. When the obstruction is not total, it is suppos’d more proper to bleed at the ankle than at the arm; and, at this last, when the discharge is altogether stopped. Her ordinary drink ought to be impregnated with nitre.

If the is colicive, emollient and gently opening glyders may be occasionally injected; and her breasts must be fomented and sucked, either by the mouth or pipe-gadles.

If, by these means, the fever is abated, and the necessary discharges return, the patient commonly recovers; but, if the complaints continue, the antiphlogistic method must still be pursued. If, notwithstanding these efforts, the fever is not diminished or removed by a plentiful discharge of the lochia from the uterus, the milk from the breasts, or by a critical evacuation by sweat, urine, or stool, and the woman is every now and then attacked with cold shiverings; an abscess or abscesses will probably be formed in the uterus or neighbouring parts, or in the breasts; and sometimes, the matter will be translated to other situations, and the seat of it foretold from the parts being affected with violent pains: these abscesses are more or less dangerous, according to the place in which they happen, the largeness of the suppuration, and the good or bad constitution of the patient.

If when the pains in the epigastic region are violent, and the fever increased to a very high degree, the patient should all of a sudden enjoy a cessation from pain, without any previous discharge or critical emption, the physician may pronounce that a mortification is begun; especially if, at the same time, the pulse becomes low, quick, wavering, and intermitting: if the woman’s countenance, from being florid, turns dusky and pale, while the her herself, and all the attendants, conceive her much mended; in that case, she will grow delirious, and die in a very short time.

What we have said on this subject, regards that fever which proceeds from the obstructed lochia, and in which the breasts may likewise be affected: but the milk fever is that in which the breasts are originally concerned, and which may happen though the lochia continue to flow in sufficient quantity; nevertheless, they mutually promote each other, and both are to be treated in the manner already explained; namely, by opiates, diluents, and diaphoretics, in the beginning; and, these prescriptions failing, the obstructions must be resolved by the antiphlogistic method described above. The milk-fever alone, when the uterus is not concerned, is not so dangerous, and much more easily relieved. Women of an healthy constitution, who suckle their own children, have good samples,
MILE, on Me paffus, a meafure of length or diftance, con-

MILBORN-_, a borough-town of Somerfetfliire, curdled in the inteffines; but, fhould none of thefe eva-

glaftes: fhould thefe methods fail, and the fever increafe, 

MILAN, the capital of the Milanefe, or dutchy of Mi-

eruptions, or loofe ffaols mixed with milk, which is 

and cataplafs muff be fubffituted, in order to foften and 

external applications hitherto ufed., emollient liniments 

fhe ought to be blooded in the arm; and inffead of the 

let the breaffs be covered with emp. de minio, diapalma, 

MIGRATION, the paffage or removal of a thing out 

critical fweats, a large difeharge from the.uterus, miliary 

ceeds for fome days, the patient is frequently relieved by 

will be relieved; at the fame time the milk muff be ex-

runs out at the nipples: but if the woman catches cold, 

excretions, as well as thofe of the breaft.

In this cafe, the fudoriiics above recommended muff 

of the breaft, and the fecretion of milk, in thefe women 

sens for emptying their breaiis. This fever likewife hap-

After the firft flowing of the menfes, which commonly 

excretions, as well as thofe of the breaft.

In order to prevent too great a turgency in the veffels 

the fecretion of milk, in thefe women 

to carry off the plethora, and bring down the cata-

inflammation continue with increasing violence, there is danger of an impoethume, 

which is to be brought to maturity, and managed like 

other inflammatory tumours; and no, affringents ought 

to be applied, left they fhould produce schitrous swell-

As the crixis of this fever, as well as of that left de-

criaffes succeeded by a fever; which may obftru<ft the o-

After the twentieth day, fome blood ought to be taken 

happens about the fifth week; if they do not appear 

before the third or fourth week; and fometimes not till 

of the body are drained off at the nipples, feldom require 

afterwards difeuded, no evacuations are neceffary 

which is to be brought to maturity, and managed like 

nifh the circulating force, but fuch only as will keep 

to be given, which will either greatly increafce or dimin-

the circulating force, but fuch only as will keep 

out the eruptions. But if, notwithstanding these eru-

relax. If, in fpite of thefe endeavours, the fever pro-

and fweating, and 

the use of.thefef applications, the tension and pain will sub-

about the fifth or fhird day, efpicially if the milk 

runs out at the nipples: but if the woman catches cold, 

or is of a full habit of body, and not very abfolmous, 

the tension and pain increafing, will bring on a cold thil-

vering succeeded by a fever; which may obfturb the o-

other excretions, as well as thofe of the breaft.

In this cafe, the fudoriiics above recommended muff 

be preferred; and if a plentiful sweat ensues, the patient 

will be reliefed; at the fame time the milk muff be extrac-

from her breasts, by fucking with the mouth or 

glaffes: fhould these methods fail, and the fever increafe, 

he ought to be blooded in the arm; and instead of the 

external applications hitherto ufed, emollient liniments 

and cataplafs muff be fubftituted, in order to foften and 

In order to prevent too great a turgency in the veffels 

and consequently the breafts, are often inflamed, 

fuelled, and obftructed.

MILDEW, a difeafe happening to plants, caufed by a 

dewy moifture fuppolled by fome to be a species of 

blight.

MILE, mille paffus, a meafure of length or diftance, con-

aining eight furlongs, &c.

The Englith statute-mile is fourfcore chains, or 

1760 yards; that is, 5280 feet.
MILFORD HAVEN, the most commodious harbour in Great Britain, situated in the south west part of Pembroke in Wales, at the north entrance of the Bristol channel.

MILIARY, in general, something resembling millet-seeds.

MILIARY FEVER. See Medicine, p. 73.

MILITANT, or CHURCH MILITANT, denotes the body of Christians while here on earth.

MILITARY, something belonging to the soldiery or militia.

MILITIA, in general, denotes the body of soldiers, or those who make profession of arms.

In a more restrained sense, militia denotes the trained bands of a town or country, who arm themselves, upon a short warning, for their own defence. So that, in this sense, militia is opposed to regular or abated troops.

For the direction and command of the militia, the king constitutes lords-lieutenants of each county.

MILL, a machine or engine for grinding corn, &c. of which there are several kinds, according to the various methods of applying the moving power; as water-mills, wind-mills, mills worked by horses, &c. See Mechanics.

MILLERIA, a genus of the fypgenefia polygamia class. See Oniscus.

MILLEPES. See Oniscus.

MILLET, in botany. See Milium.

MILLET, in botany, a genus of the triandria digynia class. The corolla consists of two valves including one flower. There are five species, only one of which, viz. the effufum, or millet-grass, is a native of Britain.

MILIUM, in botany, a genus of the triandria digynia class. The corolla is dimidiated. There are two species, both male and female. For milk is always prepared from chyle as well in men as in women, in virgins and barren women, in mothers and nurfes. Milk approaches nearer to an animal nature than chyle.

If milk be good, and suffered to rest in a clean vessel, it first appears uniformly white; then throws up a white, thick, unctuous cream to its surface, and remains somewhat bluish below. The milks of all the known animals have these properties alike. The human milk is very sweet and thin, the next is that of asses, then that of mares, then of goats, and lastly of cows: whence it is preferred in this order to consumptive persons of weak viscerum. The rennet prepared of the juices of such creatures as chew the cud being mixed with milk, coagulates it into an uniform mafs, which may be cut with a knife, and it thus spontaneously separates into whey and curds; if long boiled over the fire, it lofts its more fluid parts, and condenses into a butyrous and cheefy mafs.

MILK, a well known animal fluid, which nature predisposes in the breaft of women, and the udders of other animals, for the nourishment of their young. Milk is a liquor prepared from the aliment chewed in the mouth, digested in the stomach, perfected by the force and juices of the intestines, and elaborated by means of the melentery and its gland and juices, and the juices of the thoracic duct. It has undergone some actions of the veins, arteries, heart, lungs, and juices, and began to be assimilated; yet may still be had separate and discharged out of the body. And thus by those, who, in the primitive ages, believed that the saints will one day reign on earth with Jesus Christ a thousand years.

MILLIONS, or Chiliasts, a name given to those, who, in the primitive ages, believed that the saints will one day reign on earth with Jesus Christ a thousand years.

MILLEPES. See Oniscus.

MILLIONS, or Chiliasts, a name given to those, who, in the primitive ages, believed that the saints will one day reign on earth with Jesus Christ a thousand years.

MILLET, in botany. See Milium.

MILLING of cloth. See Fulling.

MILLION, in arithmetic, the number of ten hundred thousand, or a thousand times a thousand. See Arithmetic.

MILLREE, a Portuguese gold coin, value $1 7½ d.

MILO, or MELI, one of the islands of the Archipelago, sixty miles north of Candia.

MILT, or MELT, is a denomination by which some call the rows of fishes.

MILTON,
MILTON, the name of several market towns, as one
12 miles north east of Dorchester, and another
12 miles north east of Maidstone.

MILVEUS, in ornithology. See Falco.

MIME, in the ancient comedy, a person who acted any
character by mere gestures, and hence denominated
pantomime. See Pantomime.

MIMESIS, in rhetoric, the imitating the voice and ges-
tures of another person.

MIMOSA, the sensitive plant, in botany, a genus
of the polygama monoeica class. The calix of the
hermaphrodite consists of five teeth, and the corolla of
five segments; it has five or more stamens, one pistil-
lum, and the fruit is a pod; the calix, corolla, and
flamina of the male are the same with those of the
female. There are 43 species, all natives of the In-
dies.—The mimosa is called the sensitive plant from
its remarkable property of shrinking its leaves and
branches upon being touched by the hand or any thing
ele. This motion it performs by means of three distinct
articulations, viz. of a single leaf with its pedicle, of
the pedicle to its branch, and of the branch to the trunk or
main stem; the primary motion of all which is the closing
of the two halves of the leaf on its rib; then the rib
or pedicle itself closes; and if the motion whereat the
plant is moved be very strong, the very branches
have the sensation propagated to them, and apply
themselves to the main stem, as the simple leaves did
before to their ribs, and these ribs to their branches;
so that the whole plant, in this flate, forms itself,
from a very complexly branched figure, into a sort of
straight cylindrical one.

Many attempts have been made to account for the mo-
tion of this plant upon mechanical principles; but all
these attempts have hitherto proved unsatisfactory.

MIMUSOPS, in botany, a genus of the odandria mon-
gynia class. The calix consists of eight leaves, and
the corolla of eight petals; and the drupa is pointed.
There are two species, both natives of America.

MINDORA, one of the Philippine islands, lies feath-
west of Luconia, from which it is separated by a narrow
channel.

MINE, in natural history, a place under ground, where
metals, minerals, or even precious stones are dug up.

As, therefore, the matter dug out of mines is va-
rious, the mines themselves acquire various denomina-
tions, as gold mines, silver mines, copper mines, iron
mines, diamond mines, salt mines, mines of antiquity,
of alum, &c.

Mines, then, in general, are veins or cavities within
the earth, whose sides receding from, or approaching
together to each other, make them of unequal breadths
in different places, sometimes forming larger spaces
which are called holes: they are filled with substances,
which, whether metallic or of any other nature, are
called the loads; when the substances forming these
loads, are reducible to metal, the loads are by the
miners said to be alive, otherwise they are called dead
loads. In Cornwall and Devon, the loads always hold
their course from eastward to westward; though in
other parts of England, they frequently run from
north to south. The miners report, that the sides of
the load never bear in a perpendicular, but constantly
under-lay either to the north or to the south. The
load is frequently intercepted by the choking of a vein
of earth, or stone, or some different metallic substance;
in which case it generally happens that one part of the
load is moved a considerable distance to the one side.
This transient load is by the miners called flooking:
and the part of the lead which is to be moved, is said
to be heaved.

According to Dr. Nicol's observations upon mines,
they seem to be, or to have been, the channels thro'
which the waters pass within the earth, and, like ri-
vers, have their small branches opening into them, in
different directions. Most mines have streams of water running
through them; and when they are found dry, it seems
to be owing to the waters having changed their course,
as being obliged to it, either because the load has Hop-
ted up the ancient passages, or that some new and more
easy ones are made.

Mines, says Dr. Shaw, are liable to many contin-
gencies; being sometimes poor, sometimes so much
exhaustible, sometimes subject to be drowned, especially
when deep, and sometimes hard to trace; yet there are
many instances of mines proving highly advantageous
for hundreds of years: the mines of Potosi are to this
day worked with nearly the same success as at first;
the gold mines of Cremnitz have been worked almost
these thousand years; and our Cornish tin mines are
extremely ancient. The next profit of the silver alone,
dug in the Mifnian silver mines in Saxony, is still, in
the space of eight years, computed at a thousand fix
hundred and forty millions, besides seventy-three
tons of gold. Many mines have been discovered by
accident: a torrent first laid open a rich vein of the
silver mine at Friburg in Germany; sometimes a
violent

MINDELHEIM, a city of Germany, thirty-three miles
south east of Ulm. It is the capital of the principality
of Mindelheim, conferred on the duke of Morbrough,
by the emperor in 1704.

MINDEN, a city of Germany, the capital of a duchy
of the same name, situated forty miles west of Ha-
over.

MINDORA, one of the Philippine islands, lies south-
west of Luconia, from which it is separated by a narrow
channel.

MINE, in natural history, a place under ground, where
metals, minerals, or even precious stones are dug up.

As, therefore, the matter dug out of mines is va-
rious, the mines themselves acquire various denomina-
tions, as gold mines, silver mines, copper mines, iron
mines, diamond mines, salt mines, mines of antiquity,
of alum, &c.
violent wind, by blowing up trees, or overturning the
parts of rocks, has discovered a mine; the same has
happened by violent showers, earthquakes, thunder,
the firing of woods, or even the stroke of a plough-
share or horse's hoof.

But the art of mining does not wait for these favourable
accidents, but directly goes upon the search and
discovery of such mineral veins, ores, or sands, as
may be worth the working for metal. The principal
investigation and discovery of mines depend upon a par-
ticular sagacity, or acquired habit of judging from par-
icular signs, that metallic matters are contained in
certain parts of the earth, not far below its surface.
The principal signs of a latent metallic vein, seem re-
ducible to general heads; such as, 1. The discovery
of certain mineral waters. 2. The discolouration of
the trees or grass of a place. 3. The finding of pie-
ces of ore on the surface of the ground. 4. The rife
of warm exhalations. 5. The finding of metallic
sands, and the like. All which are so many encour-
agements for making a stricter search near the places
where anything of this kind appears; whence rules
of practice might be formed for reducing this art to a
greater certainty. But when no evident marks of a
mine appear, the skilful mineralist usually bores into
the earth, in such places as from some analogy of know-
ledge, gained by experience, or by observing the sit-
uation, course, or nature of other mines, he judges
may contain metal.

After the mine is found, the next thing to be con-
idered, is whether it may be dug to advantage. In
order to determine this, we are duly to weigh the na-
ture of the place, and its situation, as to wood, wa-
ter, carriage, healthiness, and the like; and compare
the result with the richness of the ore, the charge of
digging, fluxing, washing, and smelting.

Particularly the form and situation of the spot should
be well considered. A mine must either happen, 1.
In a mountain. 2. In a hill. 3. In a valley. Or,
4. In a flat. But mountains and hills are dug with
much greater ease and convenience, chiefly because
the drains and burrows, that is, the adits or avenues,
may be here readily cut, both to drain the water and
to form gang-ways for bringing out the lead, &c. In
all the four cases we are to look out for the veins which
the rains, or other accidental thing, may have laid
bare; and if such a vein be found, it may often be
proper to open the mine at that place, especially if the
vein prove tolerably large and rich: otherwise the most
commodeous place for situation is to be chose for the
purpose, viz. neither on a flat, nor on the tops of
mountains, but on the sides. The best situation for a
mine, is a mountainous, woody, wholesome spot; of
a safe easy ascent, and bordering on a navigable river.
The places abounding with mines are generally health-
ful, as standing high, and everywhere exposed to the air;
yet some places, where mines are found, prove
poisonous, and can, upon no account, be dug, though
ever so rich: the way of examining a suspected place
of this kind, is to make experiments upon brutes, by
exposing them to the effluvia or exhalations, to find the
effects.

Devonshire and Cornwall, where there are so many
tines of copper and tin, is a very mountainous
country, which gives an opportunity in many places
to make adits, or subterraneous drains, to some valley
at a distance, by which to carry off the water from the
mine, which otherwise would drown them out from
getting the ore. These adits are sometimes carried a
mile or two, and dug at a vast expense, as from 2000 l.
to 4000 l. especially where the ground is rocky; and yet
they find this cheaper than to draw up the water out
of the mine quite to the top, when the water runs in
plenty, and the mine is deep. Sometimes, indeed,
they cannot find a level near enough, to which an adit
may be carried from the very bottom of the mine;
yet they find it worth while to make an adit at half
the height to which the water is to be raised, thereby
saving half the expense.

The late Mr Collar, considering that sometimes from
small streams, and sometimes from little springs, or
collections of rain-water, one might have a pretty
deal of water above ground, though not a sufficient
quantity to turn an over-shot wheel, thought, that if a
sufficient fall might be had, this collection of water
might be made useful in raising the water in a mine to
the adit, where it may be carried off.

Mines, in the military art, denotes a subterraneous can-
al, or passage, dug under the wall or rampart of a
fortification, intended to be blown up by gun-powder.
The adit or passage of a mine is commonly about
four feet square; at the end of this is the chamber of
the mine, which is a cavity about five feet in width
and in length, and about six feet in height; and here
the gun-powder is fixed. The faffifice of the mine,
is the train, for which there is always a little aperture
left. There are various kinds of mines, which acquire
various names, as royal mines, ferripine-mines, fork-
ed mines, according as their passages are straight, ob-
lique, winding, &c.

MINEHEAD, a borough and port town of Somerset-
shire, which sends two members to parliament: W.
long, 3° 20', N. lat. 51° 18'.

MINERAL, in natural history, is used, in general, for
all fossil bodies, whether simple or compound, dug out
of a subterraneous mine, from which it takes its deno-
nination.

MINERAL Waters, in medicine, all those wherein any
medicinal virtues, besides those of common water, are
found.

These mineral waters are of various kinds, but they
are considered under the general titles of chalybeate,
purgative, and alterative. The most useful and com-
modious additions for examining these three kinds of
mineral waters, are, according to Dr Shaw, galls, fy-
rup of violets, and oil of tartar per deliquium. Galls
discover in them any small proportion of vitriol or dis-
olved iron, as having the property of immediately
striking a purple or black colour in all waters where
any such substance is lodged. Spirit of violet, in the
same
MINIATURE, a delicate kind of painting, distinguished by the
smallness of the figures, its being performed with dots or points instead of lines; by
the fineness of the colouring; its requiring to be viewed with great care: and by
its being usually done on vellum.

This is the nicest and most tedious of all kinds of
painting, being performed wholly with the point of the
pencil: for when the colours are laid on flat without dot-
ting, though the figures be small, and the ground either
to white or paper, it is not called painting in miniature, but
washed. There are some painters who never use any
white colour in painting in miniature, but make the ground
of the vellum serve to raise their figures; in which case
the lights appear bright in proportion to the depth and
strength of the colours of the figures. Others, before
they go to work, give the vellum a light wash with white
lead well prepared and purified. These colours that have
the least body, are the best and most commodious for
painting in miniature; as carmine, ultramarine, fine
lakes, and greens made of herbs and flowers; but besides
these, the following colours are also made use of, viz.
vermilion, black lead, brown red, mastic pale, yellow
mastic, indigo, ivory black, lamp black, Spanish
brown, umber, gall stone, brown ochre, French pink,
orpend, gamboge, Naples yellow, blander green, ver-
diter, sea-green, German althe, lake white, and white
lead. All terrestrial colours, and other gross substan-
ces, are too coarse for fine work, how well-soever they may
be ground: but the finest particles may be separated by
tempering the colour in a cup of fair water; and having
flirred it well with your finger, and the whole being
thoroughly mixed, let it be used for a while, and then
pour it by inclination into a cell that has been well
floured in hot water, and let it stand to dry. Yellow
ochre, brown red, umber, and ultramarine, purify by
fire; but if they are burnt in too fierce a fire, they change,
and the brown red turns yellow, the yellow ochre and
umber turn reddish, and so of the rest: so that if the fire is not
too fierce, it renders them softer and kinder than before,
so that the finest and purest ultramarine, burnt in a red
hot thovel, becomes much more brilliant than it was be-
fore it was burnt. Greens, blacks, greys, and yellows,
on being mixed with a little of the gall of the ox, orp,
or eel, especially of the last, acquire a luster and vivacity
not natural to them. You must take the galls of eels, and
hang them on a nail to dry; and when you use any such
paste it in brandy, and mingle some of it with the colour al-
ready tempered with gum water wherein is a little sugar-
candy. When you begin to paint, the colours must be
placed on a small ivory pallet of the size of your hand, in
the middle of which should be placed the white, well
spread out, and nearer it the lighter, and further off those
darker colours you are going to use.

Your vellum must be glued to a copper-plate, or a
piece of thin board, exactly of the same size with the in-
tended piece; in doing which, the fair side of the vel-
num should be moistened with a fine wet linen, and a piece
of white paper being put upon the back of it, it is to be
applied to the plate or board, and stretching it upon it
equally in all directions, the vellum, which ought to be
every way a finger's-breadth larger than what you glue
it to, in order to be doubled over and glued behind.
When your piece is sketched out upon the vellum with a
pencil, you must, with a little thin carmine, run over all the
strokes that may not be defaced in working; and this
done, clean your vellum with crumbs of bread. In laying
on the colours, begin with sketching or drawing with large,

MINHO, a great river of Spain, which taking its rise in
Gallicia, divides that province from Portugal, and falls
into the Atlantic at Caminha.

MINIATURE, a delicate kind of painting, distinguished
from all others by the smallness of the figures, its be-
ing performed with dots or points instead of lines; by
the fineness of the colouring: its requiring to be
viewed very near: and by its being usually done on
vellum.

MINERVALIA, in Roman antiquity, festivals celebra-
ted in honour of Minerva, in the month of March;
at which time the scholars had a vacation, and usu-
ally made a present to their masters, called, from this festi-
val, mineral.

MINERVA, a great river of Spain, which taking its rife in
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viewed very near: and by its being usually done on
vellum.

This is the nicest and most tedious of all kinds of
Vol. III. No. 79.
MIN (250)

MIN, in music, a note equal to two crotchets, or half a semibreve. See Music.

MINIMUM, in the higher geometry, the least quantity attainable in a given case.

MINISTER, a person who preaches, performs religious worship in public, administers the sacraments, &c. Ministers, in Scots law. See Law, Tit. 5.

MINISTERS, in Scots law. See Law, Tit. 5.

MINISTER, a person sent into a foreign country, to manage the affairs of his province, or of the state to which he belongs. Of the’s there are two kinds; those of the first rank are embassadors and envoys extraordinary, who represent the persons of their sovereigns. The ministers of the second rank are the ordinary residents. See Embassador.

MINIUM, or red-lead. See Chemistry, p. 84. and 136.

MINOR, in Scots law. See Law, Tit. 7.

MINOR, in logic, the second proposition of a regular sylloplism. See Logic.

MINORCA, an island in the Mediterranean, about twenty miles east of Majorca, thirty miles long, and twelve broad. It is subject to Great Britain, and only valued for its capacious harbour of Port Mahon.

MINOTAUR, in antiquity, a fabulous monster much talked of by the poets, feigned to be half man and half bull.

The minotaur was brought forth by Pasiphae, wife of Minos, king of Crete. It was shut up in the labyrinth of that island, and at last killed by Theseus.

Servius gives the explanation of this fable: he says that a secretary of king Minos, named Taurus, bull, having an intrigue with the queen Pasiphae, in the chamber of Daedalus, she was at length delivered of twins; one of whom resembled Minos, and the other Taurus. This occasioned the production to be reputed monstrous.

MINTREL, an ancient term for a fiddler, or player on any other kind of musical instrument.

MINT, the place in which the king’s money is coined. See Coinage.

There were anciently mints in almost every country in England; but the only mint at present in the British dominions, is that in the Tower of London. The officers of the mint are, 1. The warden of the mint, who is chief; he oversees the other officers, and receives the bullion. 2. The master worker; who receives the bullion.
MINUTE is also used for a short memoir, or sketch of a
MIRABILIS, marvel of Peru, in botany, a genus of the tri-
MIN U ART IA, in botany, a genus of the triandria tri-
Minute, in architecture, usually denotes the sixtieth,
Minute of time, the fiftieth part of an hour.
MINUET, in music, a very graceful kind of dance,
MIRACLE, in law, signifies a heinous offence or fault, particularly in the execution of an office.
MISSIONARIES, such ecclesiastics as are sent by any
MISTAKES, valvules. See Anatomy, p. 279.
MITSU, in botany, See MENTHA.
MINUARIA, in botany, a genus of the triandria trin-
MINE, in botany, a genus of the pentandria mono-
MINUET, in music, a very graceful kind of dance,
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MINE, in botany, a genus of the pentandria mono-
MINUET, in music, a very graceful kind of dance,
Mixture, a compound, or assemblage of several different bodies in the same mass. See Chemistry.

Mixt, or mixt body, in chemistry, that which is composed of different elements or principles. See Chemistry.

Mixture, a compound, or assemblage of several different bodies in the same mass. See Chemistry.

Mode, in metaphysics, denotes the manner of a thing's existence. See Metaphysics, p. 179.

Mode, in music, is defined to be a particular manner of constituting the octave; or, it is the melodic constitution of the octave, as it consists of seven essential sounds, besides the key or fundamental.

Mode, then, is the particular order of the consecutive degrees of an octave; the fundamental note whereof may be called the key, as it signifies that principal note which regulates the rest.

Model, in a general sense, an original pattern, proposed for any one to copy or imitate. This word is particularly used, in building, for an artificial pattern made in wood, stone, plaster, or other matter, with all its parts and proportions, in order for the better constructing and executing some great work, and to give an idea of the effect it will have in large. In all great buildings, it is much the surest way to make a model in relief, and not to trust to a bare design or draught.

Modena, a duchy of Italy, bounded by Mantua on the north, by Romania on the east, by Tuscany and Lucca on the south, and by Parma and the territory of Genoa on the west.

Modena, the capital of the duchy of that name, situated in 15° 20' E. long. and 44° 45' N. lat.

Moderator, in the schools, the person who presides at a dispute, or in a public assembly; thus the president of the annual assembly of the church of Scotland, is styled moderator.

Modern, in a general sense, something new, or of our time, in opposition to what is antique or ancient.

Modica, a town of Sicily, in the province of Noto, twenty-five miles south of Syracuse.

Modification, in philosophy, that which modifies or changes a thing, or gives it this or that manner of being.

Quantity and quality are accidents which modify all bodies.

Decree of Modification, in Scots law, a decree affecting the extent of a minister's stipend, without proportioning it among the persons liable in payment. See Law, Tit. v. 13.

Modillions, in architecture, ornaments in the corbe or niche of the Ionic, Corinthian, and Composite columns. See Architecture.

Modius, in antiquity, a kind of dry measure, in use among the Romans, for several sorts of grain.

Modulation, in music, the art of keeping in, or changing the mode or key.

Module, in architecture, a certain measure or big in a system of building. Architects generally choose the semidiameter of the bottom of the column for their module, and this they subdivide into parts or minutes. See Architecture.

MOHAWK-COUNTRY, a part of North America, inhabited by one of the five nations of the Iroquois, situated between the province of New York and the lake Ontario or Frontignac.

MOHILA,
Mole, in midwifery, a mass of fleshy matter, of a shape and size which may be mistaken for the head of an infant, or the female parts of a child.

Mombaça, or Monbasa, an island and city on the east coast of Africa, opposite to the country of Mombasa, in Zanguebar; E. long. 40°, N. lat. 10°.

Mole, in geography, a river in Surrey, so called from the town of Molesey.

Mole Cricket. See Gryllus.

Molar Teeth, or dentes molares, in anatomy, the large teeth called in English grinders. See Anatomy, p. 165.

Moldavia, a province of European Turkey, separated from Poland by the river Neißer.

Mole, in zoology. See Talpa.

Mole Cricket. See Gryllus.

Mole, in midwifery, a mass of fleshy matter, of a spherical figure, generated in the uterus, or womb, and sometimes mistaken for the head of an infant, or the female parts of a child. See Midwifery.

Mole, in geography, a river in Surrey, so called from its running, for part of its course, underground.

Mole, is also a mass of large stones laid in the sea by means of cofferdams; extending before a port, either to defend the harbour from the impetuosity of the waves, or to prevent the passage of ships without leave.

Action of Molestation, in Scots law. See Law, Tit. xxx. 19.

Mollugo, in botany, a genus of the triandria trigynia class. The calyx consists of five leaves; the corolla is wanting; and the capsule has three cells and three valves. There are five species, none of them natives of Britain.

Molasses, in commerce, the thick fluid matter remaining after the sugar is made, resembling syrup. In Holland molasses are much used in the manufacture of tobacco, and by the poor people for fuel. A brandy is also distilled from them, but it is said to be unwholesome.

Molossus, in Greek and Latin poetry, a foot composed of three long syllables, as delectant.

Molucca-islands, five islands in the Indian ocean, the largest of which is scarcely thirty miles round; they are called Bacian, Machian, Motyr, Ternate, and Typhon; they produce sago, oranges, lemons, and some other fruits; but what is peculiar to these islands, is their producing cloves. They are subject to the Dutch, and are situated in 125° of east longitude, and between 15° south, and 20° north latitude.

Moluccella, in botany, a genus of the didymia gymnosperma class. The calyx is bell-shaped, and larger than the corolla. There are three species, none of them natives of Britain.

Molwitz, a town of Silesia in the kingdom of Bohemia; E. long. 16° 45', N. lat. 50° 26'.

Molybdenum, or Molybdenum, a metal, one of the compounds of the element molybdenum, occurring in the form of yellow crystals, or as a white powder, which is always equal to the quantity of matter multiplied into the velocity; or, which is the same thing, it may be considered as a rectangle under the quantity of matter and velocity.

Momordica, in botany, a genus of the monoeia monogynia class. The calyx of the male and female consists of five segments; the corolla of the male has five segments; and the filaments are three. The corolla of the female consists of five segments; and it has three styli. There are eight species, none of them natives of Britain.

Monad, in botany, a genus of the diandria monoandria class. The corolla is unequal, the superior lip being larger than the corolla. There are three species, none of them natives of Britain.

Monarch, in botany. See Botany, p. 635.

Monarchy, a government in which the supreme power is vested in a single person. See Government.

Monarchia, in botany. See Botany, p. 635.

Monarchy, a government in which the supreme power is vested in a single person. See Government.

Monarchia, in botany. See Botany, p. 635.

Monastery, a convent, or house built for the reception and entertainment of monks, mendicant friars, or nuns, whether it be an abbey, priory, &c.

Monasteries are governed by different rules, according to the different regulations prescribed by their founders. The first regular and perfect monasteries were founded by St. Pachomius, in Egypt; but St. Basil is generally considered as the great father and patriarch of the Eastern monks; since in the fourth century he prescribed rules for the government of the monasteries, to which the Anchoress and Convents, and the others ancient fathers of the deserts, submitted. In like manner St. Benedict was styled the patriarch of the Western monks. He appeared in Italy towards the latter end of the fifth century, and published his rule, which was universally received throughout the west. St. Augulfin being sent into England by St. Gregory the pope, in the year 596, to convert the English, he at the same time introduced the monastic state into this kingdom; which made such progress there, that within the space of two hundred years, there were thirty kings and queens who preferred the religious habit to their crowns, and founded slately monasteries, where they ended their days in solitude and retirement.

Monastic, something belonging to monks. See Mon.

Monastic, something belonging to monks. See Mon.

Monaco, a two of Spain, in the province of Arragon, fifty miles north-east of Saragossa.

Monday, the first day of the week, so called as being anciently sacred to the moon, q. d. moon-day.

Monegum, a country in the south of Africa, situated between Angola and Zanguebar.

Money, a piece of matter, commonly metal, to which public authority has annexed a certain value and weight to serve as a medium in commerce.
Of artificial or material money.

I. From the infancy of the world, at least as far back as our accounts of the transactions of mankind reach, we find they had adopted the precious metals, that is, silver and gold, as the common measure of value, and as the adequate equivalent for every thing alienable.

The metals are admirably adapted for this purpose: They are perfectly homogeneous: When pure, their malleable, or bulked, are exactly in proportion to their weights: No physical difference can be found between two pounds of gold, or silver, let them be the production of the mines of Europe, Asia, Africa, or America: They are perfectly malleable, fusible, and suffer the most exact division which human art is capable to give them: They are capable of being mixed with one another, as well as with metals of a bader, that is, of a less homogeneous nature, such as copper: By this mixture they spread themselves uniformly through the whole mass of the composed lump, so that every atom of it becomes proportionally part of this noble mixture; by which means the subdivision of the precious metals is rendered very extensive. Their physical qualities are invariant; they lose nothing by keeping; they are solid and durable; and though their parts are separated by friction, like every other thing, yet till they are of the number of those which suffer least by it.

If money, therefore, can be made of any thing, that is, if the proportional value of things vendible can be measured by any thing material, it may be measured by the metals.

II. The two metals being pitched upon as the most proper substances for realizing the ideal scale of money, those who undertake the operation of adjusting a standard must constantly keep in their eye the nature and qualities of a scale, as well as the principles upon which it is formed.

The unit of the scale must constantly be the same, although realized in the metals, or the whole operation fails in the most essential part. This realizing the unit is like adjusting a pair of compasses to a geometrical scale, where the smallest deviation from the exact opening once given must occasion an incorrect measure. The metals, therefore, are to money what a pair of compasses is, to a geometrical scale.

This operation of adjusting the metals to the money of account implies an exact and determinate proportion of both metals to the money unit, realized in all the species and denominations of coin, adjusted to that standard.

The smallest particle of either metal added to, or taken away from any coin, which represents certain determinate parts of the scale, overturns the whole system of monetary value. And if, notwithstanding such variation, these coins continue to bear the same denominations as before, this will as effectually destroy their usefulness in measuring the value of things, as it would overturn the usefulness of a pair of compasses, to suffer the opening to vary, after it is adjusted to the scale representing feet, toises, miles, or leagues, by which the distances up the plan are to be measured.

III. Debasing the standard is a good term; because it conveys a clear and distinct idea. It is diminishing the weight of the pure metal contained in that denomination by which a nation reckons, and which we have called the money unit. Raising the standard requires no farther definition, being the direct contrary.

IV. Altering the standard (that is, raising or debasing the value of the money-unit) is like altering the national measures or weights. This is best discovered by comparing the tinge altered with things of the same nature which have suffered no alteration. Thus if the foot of measure was altered at once over all England, by adding to it, or taking from it, any proportional part of its standard length, the alteration would be best discovered, by comparing the new foot with that of Paris, or of any other country, which had suffered no alteration. Just so, if the pound sterling, which is the English unit, shall be found any how changed, and if the variation it has met with be difficult to ascertain, because of a complication of circumstances, the best way to discover it, will be to compare the former and the present value of it with the money of other nations which has suffered no variation. This the course of exchange will perform with the greatest exactness.

V. Artists pretend, that the precious metals, when absolutely pure from any mixture, are not of sufficient hardnece to constitute a solid and lasting coin. They are found also in the mines mixed with other metals of a bader nature, and the bringing them to a state of perfect purity occasions an unnecessary expense. To avoid, therefore, the inconvenience of employing them in all their purity, people have adopted the expedient of mixing them with a determinate proportion of other metals, which hurts neither their fusibility, malleability, beauty, or lustre. This metal is called alloy; and, being considered only as a support to the principal metal, is accounted of no value in itself. So that eleven ounces of gold, when mixed with one ounce of silver, acquires, by that addition, no augmentation of value whatever.

This being the case, we shall, as much as possible, overlook the existence of alloy, in speaking of money, in order to render language less subject to ambiguity.

Incapacities of the metals to perform the office of an invariable measure of value.

I. Were there but one species of such a substance as we have reprefented gold and silver to be; were there but one metal possessing the qualities of purity, divisibility, and durability; the inconveniences in the use of it for money would be fewer by far than they are found to be as matters stand.

Such a metal might then, by an unlimited division into parts exactly equal, be made to serve as a tolerably leady and universal measure. But the rivallhip between the metals, and the perfect equality which is found between all their physical qualities, so far as regards purity and divisibility, render them so equally well adapted to serve as the common measure of value, that they are universally admitted to pass current as money.

What is the consequence of this? That the one measures the value of the other, as well as that of every other thing. Now the moment any measure begins to be measured...
fared by another, whose proportion to it is not physically, perpetually, and invariably the same, all the uselness of such a measure is lost. An example will make this plain.

A foot of measure is a determinate length. An English foot may be compared with the Paris foot, or with that of the Rhine; that is to say, it may be measured by them; and the proportion between their lengths may be expressed in numbers; which proportion will be the same perpetually. The measuring the one by the other will occasion no uncertainty; and we may speak of lengths by Paris feet, and perfectly well understand by others who are used to measure by the English foot, or by the foot of the Rhine.

But suppose that a youth of twelve years old takes it into his head to measure from time to time, as he advances in age, by the length of his own foot, and that he divides this growing foot into inches and decimals: what can be learned from his account of measures! As he increases in years, his foot, inches, and subdivisions, will be gradually lengthening; and were every man to follow his example, and measure by his own foot, then the foot of a measure now established would totally cease to be of any utility.

This is just the case with the two metals. There is no determinate invariable proportion between their value; and the consequence of this is, that when they are both taken for measuring the value of other things, the things to be measured, like lengths to be measured by the young man's foot, without changing their relative proportion between themselves, change however with respect to the denominations of both their measures. An example will make this plain.

Let us suppose an ox to be worth three thousand pounds weight of wheat, and the one and the other to be worth an ounce of gold, and an ounce of gold to be worth exactly fifteen ounces of silver: If the cafe should happen, that the proportional value between gold and silver should come to be as 14 is to 1, would not the ox, and consequently the wheat, be estimated at less in silver, and more in gold, than formerly? Further, would it be in the power of any state to prevent this variation, in the measure of the value of oxen and wheat, without putting into the unit of their money less silver and more gold than formerly.

If therefore any particular state should fix the standard of the unit of their money to one species of the metals, while in fact both the one and the other are actually employed in measuring value; does not such a state resemble the young man, who measures all by his growing foot? For if silver, for example, be retained as the standard, while it is gaining upon gold, one at least additional value; and if gold continue all the while to determine the value of things as well as silver, it is plain, that, to all intents and purposes, this silver-measure is lengthening daily, like the young man's foot, since the same weight of it must become every day equivalent to more and more of the same commodity; notwithstanding that we suppose the same proportion to subsist, without the least variation, between that commodity and every other species of things alienable.

Buying and selling are purely conventional, and no man is obliged to give his merchantize at what may be supposed to be the proportion of its worth. The use, therefore, of an universal measure, is to mark, not only the relative value of the things to which it is applied as a measure, but to discover in an infant the proportion between the value of those, and of every other commodity valued by a determinate measure in all the countries of the world.

Were pounds sterling, livres, florins, piastras, &c. which are all money of account, invariable in their values, what a facility would it produce in all concerns, what an assistance to trade! But as they are all limited or fixed to coins, and consequently vary from time to time, this example shews the utility of the invariable measure which we have described.

There is another circumstance which incapacitates the metals from performing the office of money; the substance of which the coin is made, is a commodity, which rises and sinks in its value with respect to other commodities, according to the wants, competition, and caprices of mankind. The advantage, therefore, found in putting an intrinsic value into that substance which performs the function of money of account, is compensated by the instability of that intrinsic value; and the advantage obtained by the fiability of paper, or symbolical money, is compensated by the defect it commonly has of not being at all times susceptible of realization into solid property or intrinsic value.

In order, therefore, to render material money more perfect, this quality of metal, that is, of a commodity, should be taken from it; and in order to render papery-money more perfect, it ought to be made to circulate upon metallic or land security:

1. There are several smaller inconveniences accompanying the use of the metals, which we shall here shortly enumerate:

1. No money made of gold or silver can circulate long, without losing of its weight, although it all along preserves the same denomination. This represents the contracting a pair of compasses which had been rightly adjusted to the scale.

2. Another inconvenience proceeds from the fabrication of money. Supposing the faith of princes who coin money to be inviolable, and the probity as well as capacity of those to whom they commit the inspection of the fineness of the metals to be sufficient, it is hardly possible for workmen to render every piece exactly of a proper weight; or to preserve the due proportion between pieces of different denominations; that is to say, to make every ten guineas exactly of the same weight with every crown-piece and every five shillings struck in a coinage. In proportion to such inaccuracies, the parts of the scale become unequal.

3. Another inconvenience, and far from being inconceivable, flows from the expense requisite for the coming of money. This expense adds to its value as a manufacture, without adding anything to its weight.

4. The last inconvenience is, that by fixing the money of account entirely to the coin, without having any independent common measure to mark and control these deviations from mathematical exactness, which are either inseparable.
inseparable from the metals themselves, or from the fabrication of them) the whole measure of value, and all the relative interests of debtors and creditors, become at the disposal not only of workers in the mint, of Jews who deal in money, of clippers and walters of coin, but they are also entirely at the mercy of princes, who have the right of coinage, and who have frequently also the right of raising or debasing the standard of the coin, according as they find it most for their present and temporary interest.

Methods which may be proposed for lessening the several inconveniences to which material money is liable.

The inconveniences from the variation in the relative value of the metals to one another, may in some measure be obviated by the following expedients.

1st. By considering one only as the standard, and leaving the other to seek its own value, like any other commodity.

2nd. By considering one only as the standard, and fixing the value of the other from time to time by authority, according as the market-price of the metals shall vary.

3rd. By fixing the standard of the unit according to the mean proportion of the metals, attaching it to neither; regulating the coin accordingly; and upon every considerable variation in the proportion between them, either to make a new coinage, or to raise the denomination of one of the species, and lower it in the other, in order to preserve the unit exactly in the mean proportion between the gold and silver.

4th. To have two units, and two standards, one of gold, and one of silver, and to allow every body to stipulate in either.

5th. Or last of all, to oblige all debtors to pay one half in gold, and one half in the silver standard.

Variations to which the value of the money-unit is exposed from every disorder in the coin.

Let us suppose, at present, the only disorder to consist in a want of the due proportion between the gold and silver in the coin.

This proportion can only be established by the market-price of the metals; because an augmentation and rife in the demand for gold or silver has the effect of augmenting the value of the metal demanded. Let us suppose, that to day one pound of gold may buy fifteen pounds of silver; if to-morrow there be a high demand for silver, a competition among merchants to have silver for gold will ensue; they will contend who shall get the silver at the rate of fifteen pounds for one of gold: this will raise the price of it; and in proportion to their views of profit, some will accept of less than the fifteen pounds. This is plainly a raise in the silver, more properly than a fall in the gold; because it is the competition for the silver which has occasioned the variation in the former proportion between the metals.

Let us now suppose, that a state, having with great exactness examined the proportion of the metals in the market, and having determined the precise quantity of each for realizing or representing the money-unit, shall execute a most exact coinage of gold and silver coin. As long as that proportion continues unvaried in the market, no inconvenience can result from that quarter, in making use of metals for money of account.

But let us suppose the proportion to change; that the silver, for example, shall rise in its value with regard to gold; will it not follow, from that moment, that the unit realized in the silver, will become of more value than the unit realized in the gold coin?

But as the law has ordered them to pass as equivalents for one another, and as debtors have always the option of paying in what legal coin they think fit, will they not all choose to pay in gold, and will not then the silver coin be melted down or exported, in order to be sold as bullion, above the value it bears when it circulates in coin? Will not this paying in gold also really diminish the value of the money unit, since upon this variation every thing must fall for more gold than before, as we have already observed?

Consequently, merchandise which have not varied in their relative value to any other thing but to gold and silver, must be measured by the mean proportion of the metals; and the application of any other measure to them is altering the standard. If they are measured by the gold, the standard is debased; if by silver, it is raised.

If, to prevent the inconvenience of melting down the silver, the state shall give up affixing the value of their unit to both species at once, and shall fix it to one, leaving the other to seek its value as any other commodity; in that case, no doubt, the melting down of the coin will be prevented; but will ever this restore the value of the money unit to its former standard? Would it, for example, in the foregoing supposition, raise the debased value of the money-unit in the gold coin, if that species were declared to be the standard? It would indeed render silver coin purely a merchandise, and, by allowing it to seek its value, would certainly prevent it from being melted down as before; because the pieces would rise conventionally in their denomination; or an agio, as it is called, would be taken in payments made in silver; but the gold would not, on that account, rise in its value, or begin to purchase any more merchandise than before. Were therefore the standard fixed to the gold, would not this be an arbitrary and a violent revolution in the value of the money-unit, and a debasement of the standard?

If, on the other hand, the state should fix the standard to the silver, which we suppose to have risen in its value, would that ever sink the advanced value which the silver coin had gained above the worth of the former standard? And would not this be a violent, and an arbitrary revolution in the value of the money unit, and a raising of the standard?

The only expedient, therefore, is, in such a case, to fix the numerary unit to neither of the metals, but to contrive a way to make it fluctuate in a mean proportion between them; which is in effect the introduction of a pure ideal money of account.

The regulation of fixing the unit by the mean proportion, ought to take place at the instant the standard unit is affixed with exactness both to the gold and silver. If it
it be introduced long after the market proportion between the metals has deviated from the proportion established in the coin; and if the new regulation is made to have a retrospective, with regard to the acquitting of permanent contracts entered into, while the value of the money-unit had attached itself to the lowest currency, in consequence of the principle above laid down; then the retorting the money-unit to that standard where it ought to have remained (to wit, to the mean proportion) is an injury to all debtors who have contracted since the time that the proportion of the metals began to vary.

This is clear from the former reasoning. The moment the market-price of the metals differs from that in the coin, every one who has payments to make, pays in that species which is the highest rated in the coin; consequently, he who lends, lends in that species. If after the contract, therefore, the unit is carried up to the mean proportion, this must be a loss to him who had borrowed.

From this we may perceive, why there is less inconvenience from the varying of the proportion of the metals, where the standard is fixed to one of them, than when it is fixed to both. In the first case, it is least uncertain whether the standard or the merchandize-species is to rise; consequently it is uncertain whether the debtors or the creditors are to gain by a variation. If the standard species should rise, the creditors will gain; if the merchandize species rises, the debtors will gain; but when the unit is attached to both species, then the creditors never can gain, let the metals vary as they will: if silver rises, then debtors will pay in gold; if gold rises, debtors will pay in silver. But whether the unit be attached to one or to both species, the infallible consequence of a variation is, that one half of the difference is either gained or lost by debtors and creditors. The invariable unit is constantly the mean proportional between the two measses.

How the variations in the intrinsic value of the unit of money must affect all the domestic interest of a Nation.

If the changing the content of the bushel by which grain is measured, would affect the interest of those who are obliged to pay, or who are intitled to receive, a certain number of bushels of grain for the rent of lands; in the same manner must every variation in the value of the unit of account affect all persons who, in permanent contracts, are obliged to make payments, or who are intitled to receive sums of money stipulated in multiples or in fractions of that money unit.

Every variation, therefore, upon the intrinsic value of the money unit, has the effect of benefiting the class of creditors, at the expense of debtors, or vice versa.

This consequence is deduced from an obvious principle. Money is more or less valuable in proportion as it can purchase more or less of every kind of merchandize. Now without entering anew into the causes of the rise and fall of prices, it is agreed upon all hands, that whether an augmentation of the general mafs of money in circulation has the effect of raising prices in general, or not, any augmentation of the quantity of the metals appointed to be put into the money-unit, must at least affect the value of that money-unit, and make it purchase more of any commodity than before; that is to say, if 113 grains of fine gold, the present weight of a pound sterling in gold, can buy 113 pounds of flour; were the pound sterling raised to 114 pounds of fine metal, it would buy 114 pounds of flour; consequently, were the pound sterling augmented by one grain of gold, every miller who paid a rent of ten pounds a year, would be obliged to sell 1140 pounds of his flour, in order to procure 10 pounds to pay his rent, in place of 1130 pounds of flour which he sold formerly to procure the same sum; consequently, by this innovation, the miller must lose yearly ten pounds of flour, which his master consequently must gain. From this example, it is plain, that every augmentation of metals put into the pound sterling, either of silver or gold, must imply an advantage to the whole class of creditors who are paid in pounds sterling, and consequently must be a proportional loss to all debtors who must pay by the same denomination.

Of the disorder in the British coin, so far as it arises from the melting down or the exporting of the specie.

The defects in the British coin are three.

1st. The proportion between the gold and silver in it is found to be as 1 to 15 2/3, whereas the market price may be supposed to be nearly as 1 to 14.

2do. Great part of the current money is worn and light.

3rd. From the second defect proceeds the third, to wit, that there are several currencies in circulation which pass for the same value, without being of the same weight.

From all these defects results the least greatest inconvenience, to wit, that some innovation must be made, in order to set matters on a right footing.

The English, besides the unit of their money which they call the pound sterling, have also the unit of their weight for weighing the precious metals.

This is called the pound troy, and consists of 12 ounces, every ounce of 20 penny-weight, and every penny-weight of 24 grains. The pound troy, therefore, consists of 240 penny-weight, and 5760 grains.

The fineness of the silver is reckoned by the number of ounces and penny-weights of the pure metals in the pound troy of the composed masts; or in other words, the pound troy, which contains 5760 grains of standard silver, contains 5328 grains of fine silver, and 432 grains of copper, called alloy.

Thus standard silver is 11 ounces 2 penny-weights of fine silver in the pound troy to 18 penny-weights copper, or 111 parts fine silver to 9 parts alloy.

Standard gold is 11 ounces fine to one ounce silver or copper employed for alloy, which together make the pound troy; consequently, the pound troy of standard gold, contains 5280 grains fine, and 480 grains alloy, which alloy is reckoned of no value.

This pound of standard silver is ordered, by statute of the 43d of Elizabeth, to be coined into 62 shillings, 20 of which make the pound sterling; consequently the 20 shillings contain 1718.7 grains of fine silver, and 1858.06 standard silver.

The pound troy of standard gold, 1/1 fine, is ordered by

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by an act of King Charles II. to be cut into 44 ½ guineas; that is to say, every guinea contains 129.43 grains of standard gold, and 118.64 grains of fine gold; and the pound sterling, which is ⅓ of the guinea, contains 112.99 grains, which we may state at 113 grains of fine gold.

The coinage in England is entirely defrauded at the expense of the late. The mint price for the metals is the very same with the price of the coin. Whoever carries to the mint an ounce of standard silver, receives for it in silver coin 57. 2d. or 62d.; whoever carries an ounce of standard gold receives in gold coin 17s. 10d. the one and the other making exactly an ounce of the same fineness with the bullion. Coin, therefore, can have no value in the market above bullion; consequently, no loss can be incurred by those who melt it down.

When the guinea was first struck, the government (not inclining to fix the pound-sterling to the gold coin of the nation) fixed the guinea at 20 shillings, (which was then below its proportion to the silver) leaving it to seek its own price above that value, according to the course of the market.

By this regulation no harm was done to the English silver standard; because the guinea, or 118.64 grains fine gold being worth more at that time, than 20 shillings, or 1718.7 grains fine silver, no debtor would pay with gold at its standard value, and whatever it was received for above that price was purely conventional.

Accordingly guineas sought their own price until the year 1728, that they were fixed anew, not below their value as at first, but at what was then reckoned their exchange value, and whatever it was received for above that price was purely conventional.

The consequence of this has been, that the same guinea which was worth 1804.6 grains fine silver, at the time it was fixed at 21 shillings, is now worth no more than 1716.9 grains of fine silver according to the proportion of 14½ to 1.

Consequently, debtors, who have always the option of the legal species in paying their debts, will pay pounds sterling no more in silver but in gold; and as the gold pounds they pay in, are not intrinsically worth the silver pounds they paid in formerly, according to the statute of Elizabeth, it follows that the pound sterling in silver is really no more the standard, since no body will pay at that rate, and since no body can be compelled to do it.

Besides this want of proportion between the metals, the silver coined before the reign of George I. is now become light by circulation; and the guineas coined by all the Princes since Charles II. pass by tale, though many of them are considerably diminished in their weight.

Let us now examine what profit the want of proportion and the want of weight in the coin can afford to the money-jobbers, in melting it down or exporting it?

Did every body consider coin only as the measure for reckoning value, without attending to its value as a metal, the deviations of gold and silver coin from perfect exactness either as to proportion or weight would occasion little inconvenience.

Great numbers indeed, in every modern society, consider coin in no other light, than that of money of account; and have great difficulty to comprehend what inconvenience any one can find between a light shilling and a heavy one; or what inconvenience there can possibly result from a guinea's being some grains of fine gold too light to be worth 21 shillings standard weight. And did every one think in the same way, there would be no occasion for coin of the precious metals at all; leather, copper, iron, or paper, would keep the reckoning as well as gold and silver.

But although there be many who look no farther than at the stamp on the coin, there are others whose sole business it is to examine its intrinsic worth as a commodity, and to profit of every irregularity in the weight and proportion of metals.

By the very institution of coinage, it is implied, that every piece of the same metal, and same denomination with regard to the money-unit, shall pass current for the same value.

It is, therefore, the employment of money-jobbers, to examine, with a scrupulous exactness, the precise weight of every piece of coin which comes into their hands.

The first object of their attention is, the price of the metals in the market: a jobber finds, at present, that with 14.5 pounds of fine silver bullion, he can buy one pound of fine gold bullion.

He therefore buys up with gold coin, all the new silver as fast as it is coined, of which he can get at the rate of 15.2 pounds for one in gold; these 15.2 pounds silver coin he melts down into bullion, and converts that back into gold bullion, giving at the rate of only 14.5 pounds for one.

By this operation he remains with the value of \( \frac{1}{16} \) of one pound weight of silver bullion clear profit upon the 14½ pounds he bought; which \( \frac{1}{16} \) is really lost by the man who inadvertently coined silver at the mint, and gave it to the money-jobber for his gold. Thus the state loses the expence of the coinage, and the public the convenience of change for their guineas.

But here it may be asked, Why should the money-jobber melt down the silver coin? can he not buy gold with it as well without melting it down? He cannot; because when it is in coin, he cannot avail himself of its being new and weighty. Coin goes by tale, not by weight; therefore, were he to come to market with his new silver coin, gold bullion being sold at the mint price, we shall suppose, viz. at 3l. 17s. 10½d. sterling money per...
per ounce, he would be obliged to pay the price of what
he bought with heavy money, which he can equally do
with light.

He therefore melts down the new silver coin, and sells
it for bullion, at so many pence an ounce, the price of
which bullion is, in the English market, always above
the price of silver at the mint, for the reasons now to be
given.

When you sell standard silver bullion at the mint, you
are paid in weighty money; that is, you receive for your
bullion the very same weight in standard coin; the coin-
age costs nothing; but when you sell bullion in the mar-
et, you are paid in worn out silver, in gold, in bank
notes, in short, in every species of lawful current money.
Now all these payments have some defect: the silver you
are paid with is worn and light; the gold you are paid
with is over-rated, and perhaps also light; and the bank
notes must have the same value with the specie with which
the bank pays them; that is, with light silver or over-
rated gold.

It is for these reasons, that silver bullion, which is
bought by the mint at 5s. 2d. per ounce of heavy silver
money, may be bought at market at 6s. pence the ounce
in light silver, over-rated gold, or bank notes, which is
the same thing.

Farther, we have seen how the imposition of coinage
has the effect of raising coin above the value of bullion,
by adding a value to it which it had not as a metal.
Just so, when the unit is once affixed to certain deter-
mined quantities of both metals, if one of the metals
should afterwards rise in value in the market, the coin
made of that metal must lose a part of its value as coin,
although it retains it as a metal. Consequently, as in
the first case, it acquired an additional value by being
coined, it must now acquire an additional value by being
melted down. From this we may conclude, that when
the standard is affixed to both the metals in the coin, and
when the proportion of that value is not made to follow
the price of the market, that species which rises in the
market is melted down, and the bullion is sold for a price
as much exceeding the mint price as the metal has rifen
in its value.

If, therefore, in England, the price of silver bullion is
found to be at 65 pence the ounce, while at the mint it
is rated at 62 s; this proves that silver has rifen \(\frac{1}{12}\) above
the proportion observed in the coin, and that all coin of
standard weight may consequently be melted down with
a profit of \(\frac{1}{12}\). But as there are several other circum-
stances to be attended to, which regulate and influence
the price of bullion we shall here pass them in review,
the better to discover the nature of this disorder in the
English coin; and the advantages which money-jobbers
may draw from it.

The price of bullion, like that of every other merchan-
dize, is regulated by the value of the money it is paid
with.

If bullion, therefore, sells in England for 65 pence
an ounce, paid in silver coin, it must sell for 67 shillings
the pound troy; that is to say, the shillings it is com-
monly paid with do not exceed the weight of \(\frac{1}{12}\) of a
pound troy: for if the 65 shillings with which the pound
of bullion is paid weighed more than a pound troy, it
would be a shorter and better way for him who wants
bullion to melt down the shillings and make use of the
metal, than to go to market with them in order to get
lefs.

We may, therefore, be very certain, that no man will
buy silver bullion at 6s pence an ounce, with any shilling
which weighs above \(\frac{1}{12}\) of a pound troy.

We have gone upon the supposition that the ordinary
price of bullion in the English market is 65 pence per
ounce. This has been done upon the authority of some
late writers on this subject: it is now proper to point
out the causes which may make it deviate from that
value.

I. It may vary, and certainly will vary, in the price, ac-
cording as the currency is better or worse. When the
expences of a war, or a wrong balance of trade, have
carried off a great many heavy guineas, it is natural that
bullion should rife; because then it will be paid for more
commonly in light gold and silver; that is to say,
with pounds sterling, below the value of 113 grains
fine gold, the worth of the pound sterling in new guineas.

II. This wrong balance of trade, or a demand for
bullion abroad, becoming very great, may occasion a
scarcity of the metals in the market, as well as a scar-
city of the coin; consequently, an advanced price must be
given for it in proportion to the greatness and height of
the demand. In this case, both the specie and the bullion
must be bought with paper. But the rife in the price of
bullion proceeds from the demand for the metals, and
the competition between merchants to procure them, and
not because the paper given as the price is at all of inferior
value to the specie. The least discredit of this kind would
not tend to diminish the value of the paper; it would an-
nihilate it at once. Therefore, since the metals must be
had, and that the paper cannot supply the want of them
when they are to be exported, the price rifes in propor-
tion to the difficulties in finding metals elsewhere than in
the English market.

III. A sudden call for bullion, for the making of plate.
A goldsmith can well afford to give 67 pence for an ounce
of silver, that is to say, he can afford to give one pound
of gold for 14 pounds of silver, and perhaps for less,
notwithstanding that what he gives be more than the or-
dinary proportion between the metals, because he indemni-
fies himself amply by the price of his workmanship: juft as
a tavern keeper will pay any price for a fine fiffi, becaufe,
like the goldsmith, he buys for other people.

IV. The mint price has as great an effect in bringing
down the price of bullion, as exchange has in raising it.
In countries where the metals in the coin are jufily pro-
portioned, where all the currencies are of legal weight,
and where coinage is imposed, the operations of trade
make the price of bullion constantly to fluctuate be-
tween the value of the coin and the mint price of the
metals.

Now let us suppose that the current price of silver bul-
lion in the market is 65 pence the ounce, paid in lawful
money, no matter of what weight, or of what metal.
Upon this the money jobber falls to work. All shillings
which are above \(\frac{1}{12}\) of a pound troy, he throws into his
melting
melting pot, and sells them as bullion, for 63d. per ounce; all those which are below that weight he carries to market, and buys bullion with them, at 65d. per ounce.

What is the consequence of this?

That those who sell the bullion, finding the shillings which the money jobber pays with perhaps not above \( \frac{2}{3} \) of a pound troy, they on their side raise the price of their bullion to 66d. the ounce.

This makes new work for the money-jobber; for he must always gain. He now weighs all shillings as they come to hand; and as formerly he threw into his melting-pot those only which were worth more than \( \frac{2}{3} \) of a pound troy, he now throws in all that are in value above \( \frac{2}{3} \). He then sells the melted shillings at 66d. the ounce, and buys bullion with the light ones at the same price.

This is the consequence of ever permitting any species of coin to pass by the authority of the stamp, without controlling it at the same time by the weight: and this is the manner in which money-jobbers gain by the currency of light money.

It is no argument against this exposition of the matter to say, that silver bullion is seldom bought with silver coin; because the pence in new guineas are worth no more than the pence of shillings of 65 in the pound troy; that is to say, that 240 pence contained in \( \frac{2}{3} \) of a new guinea, and 240 pence contained in 28 shillings of 65 to the pound troy differ no more in the intrinsic value than 0.83 of a grain of fine silver upon the whole, which is a mere trifle.

-Whenever, therefore, shillings come below the weight of \( \frac{2}{3} \) of a pound troy, then there is an advantage in changing them for new guineas; and when that is the case, the new guineas will be melted down, and profit will be found in selling them for bullion, upon the principles we have just been explaining.

We have already given a specimen of the domestic operations of the money-jobbers; but there are not the most prejudicial to national concerns. The jobbers may be supposed to be Englishmen; and in that case the profit they make remains at home: but whenever there is a call for bullion to pay the balance of trade, it is evident that this will be paid in silver coin, never in gold, if heavy silver can be got; and this again carries away the silver coin, and renders it at home so rare, that great inconvenience are found for want of the better denominations of it. The loss, however, here is confined to an inconvenience; because the balance of trade being a debit which must be paid, we do not consider the exportation of the silver for that purpose as any consequence of the disorder of the coin. But besides this exportation which is necessary, there are others which are arbitrary, and which are made only with a view to profit of the wrong proportion.

When the money-jobbers find difficulty in carrying on the traffic we have described, in the English market, because of the competition among themselves, they carry the silver coin out of the country, and sell it abroad for gold, upon the same principles that the East India company send silver to China, in order to purchase gold.

It may be demanded, what hurt this trade can do to England, since those who export silver bring back the same value in gold? Were this trade carried on by natives, there would be no loss; because they would bring home gold for the whole intrinsic value of the silver. But if we suppose foreigners sending over gold to be coined at the English mint, and changing that gold into English silver coin, and then carrying off this coin, it is plain that they must gain the difference, as well as the money jobbers. But it may be answered, that having given gold for silver at the rate of the mint, they have given value for what they have received. Very right; but so did Sir Hans Sloane, when he paid five guineas for an overgrown toad: he got value for his money; but it was value only to himself. Just so, whenever the English government shall be obliged to restore the proportion of the metals, (as they must do,) this operation will annihilate that imaginary value which they have bitherto set upon gold; which imagination is the only thing which renders the exchange of their silver against the foreign gold equal.

But it is farther objected, that foreigners cannot carry off the heavy silver; because there is none to carry off. Very true; but then they have carried off a great quantity already: or if the English Jews have been too sharp to allow such a profit to fall to strangers, (which may or may not have been the case,) then this disorder is an effectual step to any more coinage of silver for circulation.

Of the disorder in the British coin, so far as it affects the value of the pound sterling currency.

From what has been said, it is evident, that there must be found in England two legal pounds sterling, of different values; the one worth 113 grains of fine gold, the other worth 1718.7 grains of fine silver. We call them different; because these two portions of the precious metals are of different values all the over Europe.

But besides these two different pounds sterling, which the change in the proportion of the metals have created, the other defects of the circulating coin produce similar effects. The guineas coined by all the Princes since K. Charles II. have been of the same standard weight and fineness, 44\(\frac{1}{4}\) in a pound troy of standard gold \(\frac{1}{2}\) fine: these have been constantly wearing ever since they have been coined; and in proportion to their wearing they are of less value.

If, therefore, the new guineas are below the value of a pound sterling in silver, standard weight, the old must be of less value still. Here then is another currency, that is, another pound sterling; or indeed, more properly speaking, there are as many different pounds sterling, as there are guineas of different weights. This is not all; the money jobbers having carried off all the weighty silver; that which is worn with use, and reduced even below the standard of gold, forms one currency more, and totally destroys all determinate proportion between the money unit and the currencies which are supposed to represent it.

It may be asked, how, at this rate, any silver has remained in England? It is answered, that the few weighty shillings which still remain in circulation, have marvelously escaped the hands of the money-jobbers; and as for the rest, the rubbing and wearing of these pieces has done
done what the state might have done; that is to say, it has reduced them to their due proportion with the lightest gold.

The disorder, therefore, of the English coin has rendered the standard of a pound sterling quite uncertain. To say that it is 1718.7 grains of fine silver, is quite ideal. Who are paid in rich pounds? To say that it is 113 grains of pure gold, may also not be true; because there are many currencies worse than the new guineas.

What then is the consequence of all this disorder? What effect has it upon the current value of a pound sterling? And which way can the value of that be determined?

The operations of trade bring value to an equation, notwithstanding the greatest irregularities possible, and so in fact a pound sterling has acquired a determinate value over all the world by the means of foreign exchange. This is a kind of ideal scale for measuring the British coin, although it has not all the properties of that described above.

Exchange considers the pound sterling as a value determined according to the combination of the values of all the different currencies, in proportion as payments are made in the one or the other; and as debtors generally take care to pay in the worst species they can, it consequently follows, that the value of the pound sterling should fall to that of the lowest currency.

Were there a sufficient quantity of worn gold and silver to acquit all bills of exchange, the pound sterling would come down to the value of them; but if the new gold be also necessary for that purpose, the value of it must be proportionally greater.

All these combinations are liquidated and compensated with one another, by the operations of trade and exchange: and the pound sterling, which is so different is itself, becomes thereby, in the eyes of commerce, a determinate unit, subject however to variations, from which it never can be exempted.

Exchange, therefore, is one of the best measures for valuing a pound sterling, present currency. Here occurs a question:

Does the great quantity of paper money in England tend to diminish the value of the pound sterling?

We answer in the negative. Paper money is just as good as gold or silver money, and no better. The variation of the standard; we have already said, must influence the interests of debtors and creditors proportionally everywhere. From this it follows, that all augmentation of the value of the money unit in the specie must hurt the debtors in the paper money; and all diminutions, on the other hand, must hurt the creditors in the paper money as well as every where else. The payments, therefore, made in paper money, never can contribute to the regulation of the standard of the pound sterling; it is the specie received in liquidation of that paper money which alone can contribute to mark the value of the British unit; because it is affixed to nothing else.

From this we may draw a principle, "That in countries where the money unit is entirely affixed to the coin, the actual value of it is not according to the legal standard of that coin, but according to the mean proportion of the actual worth of those currencies in which debts are paid.

From this we see the reason why the exchange between England and all other trading towns in Europe has long appeared so unfavourable. People calculate the real par, upon the supposition that a pound sterling is worth 1718.7 grains troy of fine silver, when in fact the currency is not perhaps worth 1638, the value of a new guinea in silver, at the market proportion of 1 to 14.3; that is to say, the currency is but 95.3 per cent of the silver standard of the 43d of Elizabeth. No wonder then if the exchange be thought unfavourable.

From the principle we have just laid down, we may gather a confirmation of what we advanced concerning the cause of the advanced price of bullion in the English market.

When people buy bullion with current money at a determinate price, that operation, in conjunction with the course of exchange, ought naturally to mark the actual value of the pound sterling with great exactness.

If therefore the price of standard bullion in the English market, when no demand is found for the exportation of the metals, that is to say, when paper is found for paper upon exchange, and when merchants versed in these matters judge exchange (that is, remittances) to be at par, if then, silver bullion cannot be bought at a lower price than 65 pence the ounce, it is evident that this bullion might be bought with 65 pence in shillings, of which 65 might be coined out of the pound troy English standard silver; since 65 per ounce implies 65 shillings for the 12 ounces or pound troy.

This plainly shews how standard silver bullion should sell for 65 pence the ounce, in a country where the ounce of standard silver in the coin is worth no more than 62; and were the market price of bullion to stand uniformly at 65 pence per ounce, that would shew the value of the pound sterling to be tolerably fixed. All the heavy silver coin is now carried off; because it was intrinsically worth more than the gold it passed for in currency. The silver therefore which remains is worn down to the market proportion of the metals, as has been said; that is to say, 20 shillings in silver currency are worth 113 grains of fine gold, at the proportion of 1 to 14.5 between gold and silver. Now, as 1 is to 14.5, so is 113 to 1638.

So the 20 shillings current weight but 1638 grains fine silver, instead of 1718.7, which they ought to do according to the standard.

Now let us speak of standard silver, since we are examining how far the English coin must be worn by use.

The pound troy contains 5760 grains. This, according to the standard, is coined into 62 shillings; consequently, every shilling ought to weigh 92.9 grains. Of such shillings it is impossible that ever standard bullion should sell at above 62 pence per ounce. If therefore bullion sells for 65 pence, the shillings with which it is bought must weigh no more than 88.64 grains standard silver; that is, they must lose 4.29 grains, and are reduced to 3/8 of a pound troy.

But it is not necessary that bullion be bought with shillings; no fluctuation of price is ever made farther, than at so many pence sterling per ounce. Does not this virtually determine the value of such currency with regard to it?
The price of bullion, therefore, when it is not influenced by extraordinary demand, (such as for the payment of a balance of trade, or for making an extraordinary provision of plate) but when it stands at what everybody knows to be meant by the common market price, is a very tolerable measure of the value of the actual money standard in any country.

If it be therefore true, that a pound sterling cannot purchase above $658$ grains of fine silver bullion, it will require not a little logic to prove that it is really, or has been for these many years, worth any more; notwithstanding the standard weight of it in England is regulated by the laws of the kingdom at $1718.7$ grains of fine silver.

If to this valuation of the pound sterling drawn from the price of bullion, we add the other drawn from the course of exchange; and if by this we find, that when paper is found for paper upon exchange, a pound sterling cannot purchase above $658$ grains of fine silver in any country in Europe; upon these two authorities we may very safely conclude (as to the matter of fact at least,) that the pound sterling is not worth more, either in London or in any other trading city; and if this be the case, it is just worth $20$ shillings of $65$ to the pound troy.

If therefore the mint were to coin shillings at that rate, and pay for silver bullion at the market price, that is, at the rate of $65$ pence per ounce in those new coined shillings, they would be in proportion to the gold; silver would be carried to the mint equally with gold, and would be as little subject to be exported or melted down.

It may be inquired in this place, how far the coining the pound troy into $65$ shillings is contrary to the laws of England?

The moment a state pronounces a certain quantity of gold to be worth a certain quantity of silver, and orders the respective quantities of each metal to be made as equivalents of each other, and as lawful money in payments, that moment gold is made a standard as much as silver. If therefore too small a quantity of gold be ordered or permitted to be considered as a standard for the unit, the silver standard is from that moment debased; or indeed, more properly speaking, all silver money is from that moment profligate; for who, from that time, will ever pay in silver, when he can pay cheaper in gold?

Gold, therefore, by such a law, is made the standard, and all declarations to the contrary are against the matter of fact.

Were the king, therefore, to coin silver at $65$ shillings in the pound, it is demonstration, that by such an act he would commit no adulteration upon the standard: the adulteration is already committed. The standard has descended to where it is, by slow degrees, and by the operation of political causes only; and nothing prevents it from falling lower, but the standard of the gold coin. Let guineas be now left to seek their value as they did formerly, and let light silver continue to go by tale, we shall see the guineas up at $30$ shillings in $20$ years time, as was the case in 1695.

It is as absurd to say that the standard of Queen Elizabeth has not been debased by enacting that the English unit shall be acquainted with $113$ grains of fine gold, as it would be to affirm that it would not be debased from what it is at present by enacting that a pound of butter should everywhere be received in payment for a pound sterling; although the pound sterling should continue to consist of $3$ ounces, $17$ pennyweights, and $10$ grains of standard silver, according to the statute of the $43d$ of Elizabeth. In that case most debtors would pay in butter, and silver would, as at present, acquire a conventional value as a metal, but would be looked upon no longer as a standard, or as money.

If therefore, by the law of England, a pound sterling must consist of $1718.7$ grains troy of fine silver; by the law of England also, $113$ grains of gold must be of the same value; but no law can establish that proportion; consequently, in which ever way a reformation be brought about, some law must be revered; consequently, expediency, and not compliance with law, must be the motive in reforming the abuse.

From what has been said, it is not at all surprising that the pound sterling should in fact be reduced nearly to the value of the gold. Whether it ought to be kept at that value is another question. All that we here decide is, that coining the pound troy into $65$ shillings would restore the proportion of the metals, and render both species common in circulation. But restoring the weight and proportion of the coin is not the difficulty which prevents a reformation of the English coinage.

Circumstances to be attended to in a new regulation of the British coin.

To people who do not understand the nature of such operations, it may have an air of justice to support the unit at what is commonly believed to be the standard of Queen Elizabeth, to wit, at $1718.5$ grains of fine silver.

The regulating the standard of both silver and gold to $113$ fine, and the pound sterling to four ounces standard silver, as it stood during the reign of Queen Mary I. has also its advantages, as Mr Harris has observed. It makes the crown piece to weigh just one ounce, the shilling four penny weight, and the penny eight grains; consequently, were the new statute to bear, that the weight of the coin should regulate its currency upon certain occasions, the having the pieces adjusted to certain aliquot parts of weight would make weighing easy, and would accustom the common people to judge of the value of money by its weight, and not by the stamp.

In that case, there might be a convenience in striking the gold coins of the same weight with the silver; because the proportion of their values would then constantly be the same with the proportion of the metals. The gold crowns would be worth at present, 3l. 12s. 6d. the
half crowns 17. 16 s. 3 d. the gold shillings 14 s. and 6 d.
and the half 7 s. and 3 d. This was anciently the prac-
tice in the Spanish mints.

The interests within the state can be no wise perfectly protected but by permitting conversions of value from the old to the new standard, whatever it be, and by regulating the footing of such conversions by act of parliament, according to circumstances.

For this purpose, we shall examine those interests which will chiefly merit the attention of government, when they form a regulation for the future of acquitting permanent contracts already entered into. Such as may be contrac-
ted afterwards will naturally follow the new standard.

The landed interest is, no doubt, the most considerable in the nation. Let us therefore examine, in the first place, what regulations it may be proper to make, in or-
der to do justice to this great class, with respect to the land-tax on one hand, and with respect to their leases on the other.

The valuation of the lands of England was made many years ago, and reasonably ought to be supported at the real value of the pound sterling at that time, according to the principles already laid down. The general valua-
tion, therefore, of the whole kingdom will rise according to this scheme. This will be considered as an injustice; and no doubt it would be so, if, for the future, the land tax be imposed as heretofore, without attending to this circumstance; but as that imposition is annual, as it is laid on by the landed interest itself, who compose the parliament, it is to be supposed that this great class will at least take care of their own interest.

Were the valuation of the lands to be fixed according to the valuation of the pound sterling of 1718 7 grains of silver, which is commonly supposed to be the standard of Elizabeth, there would be no great injury done: this would raise the valuation only 5 per cent. and the land tax in proportion.

There is no class of inhabitants in all England so much at their ease, and so free from taxes, as the class of far-
mers. By living in the country, and by consuming the fruits of the earth without their suffering any alienation, they avoid the effect of many excises, which, by those who live in corporations, are felt upon many articles of their consumption, as well as on those which are immedi-
ately loaded with these impositions. For this reason it will not, perhaps, appear unreasonable, if the addi-
tional 5 per cent. on the land tax were thrown upon this class, and not upon the landlords.

With respect to leases, it may be observed, that we have gone upon the supposition that the pound sterling in the year 1728, was worth 1718.7 grains of fine silver, and 113 grains of fine gold.

There would be no injustice done the lessors of all the lands in the kingdom, were their rents to be fixed at the mean proportion of these values. We have observed how the pound sterling has been gradually diminishing in its worth from that time by the gradual rise of the silver. This mean proportion, therefore, will nearly answer to what the value of the pound sterling was in 1743; sup-
poing the rise of the silver to have been uniform.

It may be farther alleged in favour of the landlords,
action of the month of December 1749. The great sums borrowed and paid back by the nation during that period will furnish data sufficient for that calculation. Let this value of the pound be specified in Troy grains of fine silver and fine gold bullion, without mentioning any denomination of money according to the exact proportion of the metals at that time. And let this pound be called the pound of national credit.

This first operation being determined, let it be estimated, that the pound sterling, by which the state is to borrow for the future, and that in which the creditors are to be paid, shall be the exact mean proportion between the quantities of gold and silver above specified, according to the actual proportion of the metals at the time such payments shall be made; or that the sums shall be borrowed or acquitted, one half in gold and one half in silver, at the respective requisitions of the creditors or of the state, when borrowing. All debts contracted posterior to 1749 may be made liable to conversions.

The consequence of this regulation will be the insensible establishment of a bank money. Nothing would be more difficult to establish, by a positive resolution, than such an invariable measure; and nothing will be found so easy as to let it establish itself by its own advantages. This bank money will be liable to much fewer inconveniences than that of Amsterdam. There the persons transacting must be upon the spot; here, the flerling currency may, every quarter of a year, be adjusted by the exchequer to this invariable standard, for the benefit of all debtors and creditors, who incline to profit of the stability of this measure of value.

This scheme is liable to no inconvenience from the variation of the metals, let them be ever so frequent, or hard to be determined; because upon every occasion where there is the smallest doubt as to the actual proportion, the option competent to creditors to be paid half in silver and half in gold will remove.

Such a regulation will also have this good effect, that it will give the nation more just ideas of the nature of money, and consequently of the influence it ought to have upon prices.

If the value of the pound sterling shall be found to have been by accident less in December 1749, than it is at present; or if at present the currency be found below what has commonly been since 1749, in justice to the creditors, and to prevent all complaints, the nation may grant them the mean proportion of the value of the pound sterling from 1749 to 1760; or any other which may to parliament appear reasonable.

This regulation must appear equitable in the eyes of all Europe; and the strongest proof of it will be, that it will not produce the smallest effect prejudicial to the interest of the foreign creditors. The course of exchange with regard to them will stand precisely as before.

A Dutch, French, or German creditor, will receive the same value for his interest in the English docks as heretofore. This must silence all clamours at home, being the most convincing proof, that the new regulation of the coin will have made no alteration upon the real value of any man's property, let him be debtor or creditor.

The interest of every other denomination of creditors, whose contracts are of a fresh date, may be regulated upon the same principles. But where debts are of an old standing, justice demands, that attention be had to the value of money at the time of contracting. Nothing but the stability of the English coin, when compared with that of other nations, can make such a proposal appear extraordinary. Nothing is better known in France than this stipulation added to obligations, Argent au cours de ce jours; that is to say, that the sum shall be paid in coin of the same intrinsic value with what has been lent. Why should such a clause be thought reasonable for guarding people against arbitrary operations upon the numerary value of the coin, and not be found just upon every occasion where the numerary value of it is found to be changed, let the cause be what it will?

The next interest we shall examine is that of trade. When men have attained the age of twenty one, they have no more occasion for guardians. This may be applied to traders: they can party with their pen every inconvenience which may result to other people from the changes upon money, provided only the laws permit them to do themselves justice with respect to their engagements. This class demands no more than a right to convert all reciprocal obligations into denominations of coin of the same intrinsic value with those they have contracted in.

The next interest is that of buyers and sellers; that is, of manufacturers with regard to consumers, and of servants with respect to those who hire their personal service.

The interest of this class requires a most particular attention. They must, literally speaking, be put to school, and taught the first principles of their trade, which is buying and selling. They must learn to judge of price by the grains of silver and gold they receive. They are children of a mercantile mother, however warlike the father's disposition may be. If it be the interest of the state that their bodies be rendered robust and active, it is no less the interest of the state that their minds be instructed in the first principle of the trade they exercise.

For this purpose, tables of conversion from the old standard to the new must be made, and ordered to be put up in every market, in every shop. All duties, all excises, must be converted in the same manner. Uniformity must be made to appear everywhere. The smallest deviation from this will be a stumbling block to the multitude.

Not only the interest of the individuals of the class we are at present considering, demands the nation's care and attention in this particular; but the prosperity of trade, and the well-being of the nation, are also deeply interested in the execution.

The whole delicacy of the intricate combinations of commerce depends upon a just and equitable vibration of prices, according as circumstances demand it. The more therefore the insidious classes are instructed in the principles which influence prices, the more easily will the machine move. A workman then learns to fix his price without regret, and can raise it without avidity. When principles are not understood, prices cannot gently fall, they
they must be pulled down; and merchants dare not suffer them to rise, for fear of abuse, even although the perfection of an infant manufacture should require it.

The last interest is that of the bank of England, which naturally must regulate that of every other.

Had this great company followed the example of other banks, and established a bank money of an invariable standard, as the measure of all their debts and credits, they would not have been liable to any inconvenience upon a variation of the standard.

The bank of England was projected about the year 1694, at a time when the current money of the nation was in the greatest disorder, and government in the greatest distress, both for money and credit. Commerce was then at a very low ebb; and the only, or at least the most profitable trade of any, was jobbing in coin, and carrying backwards and forwards the precious metals from Holland to England. Merchants profited also greatly from the effects which the utter disorder of the coin produced upon the price of merchandise.

At such a juncture the resolution was taken to make a new coinage; and upon the prospect of this, a company was found, who, for an exclusive charter to hold a bank for 13 years, willingly lent the government upwards of a million sterling at 8 per cent. (in light money we suppose) with a prospect of being repaid both interest and capital in heavy. This was not all: part of the money lent was to be applied for the establishment of the bank; and no less than 4000 pounds a year was allowed to the company, above the full interest, for defraying the charge of management.

Under such circumstances the introduction of bank-money was very superfluous, and would have been very impolitic. That invention is calculated against the raising of the standard; but here the bank profited of that rise in its quality of creditor for the money lent, and took care not to commence debtor by circulating their paper, until the effect of the new regulation took place in 1695; that is, after the general recoinage of all the clipped silver.

From that time till now, the bank of England has been the basis of the nation's credit, and with great reason has been constantly under the most intimate protection of every minister.

The value of the pound sterling, as we have seen, has been declining ever since the year 1601, the standard being fixed to silver during all that century, while the gold was constantly rising. No sooner had the proportion taken another turn, and silver begun to rise, than the government of England threw the standard virtually upon the gold, by regulating the value of the guineas at the exact proportion of the market. By these operations, however, the bank has constantly been a gainer (in its quality of debtor) upon all the paper in circulation; and therefore has lost nothing by not having established a bank-money.

The interest of this great company being established upon the principles we have endeavoured to explain, it is very evident, that the government of England never will take any step in the reformation of the coin which in its consequences can prove hurtful to the bank. Such a step would be contrary both to justice and to common sense. To make a regulation which, by raising the standard, will prove beneficial to the public creditors, to the prejudice of the bank (which we may call the public debtor) would be an operation upon public credit, like that of a person who is at great pains to support his house by props upon all sides, and who at the same time blows up the foundation of it with gun-powder.

We may therefore conclude, that with regard to the bank of England, as well as to every other private banker, the notes which are constantly payable upon demand must be made liable to a conversion at the actual value of the pound sterling at the time of the new regulation.

That the bank will gain by this, is very certain; but the circulation of their notes is so swift that it would be absurd to allow to the then possessors of them that indemnification which naturally should be shared by all those through whose hands they have passed, in proportion to the debasement of the standard during the time of their respective possession.

Besides these considerations, which are in common to all states, the government of Great Britain has one peculiar to itself. The interest of the bank, and that of the creditors, are diametrically opposite: every thing which raises the standard, hurts the bank; every thing which can sink it, hurts the creditors: and upon the right management of the one and the other, depends the solidity of public credit. For these reasons, without the most certain prospect of conducting a refutlation of the standard to the general advantage as well as approbation of the nation, no minister will probably ever undertake so dangerous an operation.

We shall now propose an expedient which may remove at least some of the inconveniences which would result from so extensive an undertaking as that of regulating the respective interests in Great Britain by a positive law, upon a change in the value of their money of account.

Suppose then, that, before any change is made in the coin, government should enter into a transaction with the public creditors, and ascertain a permanent value for the pound sterling for the future, specified in a determined proportion of the fine metals in common bullion, without any regard to money of account, or to any coin whatever.

This preliminary step being taken, let the intended alteration of the standard be proclaimed a certain time before it is to commence. Let the nature of the change be clearly explained, and let all such as are engaged in contracts which are dissoluble at will upon the prefcriptions stipulated, be acquitted between the parties, or innovated as they shall think proper, with certification, that, posterior to a certain day, the stipulations formerly entered into shall be binding according to the denominations of the money of account in the new standard.

As to permanent contracts, which cannot at once be fulfilled and dissolved, such as leases, the parliament may either prescribe the methods and terms of conversion; or a liberty may be given to the parties to annul the contract, upon the debtor's refusing to perform his agreement according to the new standard. Contracts, on the other hand, might remain liable, with respect to credi-
tors who would be satisfied with payments made on the footing of the old standard. If the rise intended should not be very considerable, no great injustice can follow such a regulation.

Annuities are now thoroughly understood, and the value of them is brought to so nice a calculation, that nothing will be easier than to regulate these upon the footing of the value paid for them, or of the subject affected by them. If by the regulation land rents are made to rise in denomination, the annuities charged upon them, ought to rise in proportion; if in intrinsic value, the annuity should remain as it was.

Regulations which the principles of this inquiry point out as expedient to be made by a new statute for regulating the British coin.

Let us now examine what regulations it may be proper to make by a new statute concerning the coin of Great Britain, in order to preserve always the same exact value per to make by a new statute concerning the coin of Great Britain, in order to preserve always the same exact value per pound troy fine.

The first point is to determine the exact number of grains of fine gold and fine silver which are to compose it, according to the proportion of the metals in the London market.

Let the new proportion between the market price of the metals be called \( P \) and \( S \).

1. To determine the proportion of these metals with the pound troy, and in regard that the standard of gold and silver is different, let the mint price of both metals be regulated according to the pound troy fine.

2. To fix the mint price within certain limits: that is to say, to leave to the King and Council, by proclamation, to carry the mint price of bullion up to the value of the coin, as is the present regulation, or to fix it to per cent. below that price, according as government shall incline to impose a duty upon coinage.

3. To determine the proportion of the metals above the pound troy fine, and in regard that the standard of gold and silver is different, let the mint price of bullion be regulated according to the pound troy fine.

4. To order, that silver and gold coin shall be struck of such denominations as the King shall think fit to appoint; in which the proportion of the metals above determined shall be constantly observed through every denomination of the coin, until necessity shall make a new general coinage unavoidable.

5. To have the number of grains of the fine metal in every piece marked upon the exergue, or upon the legend of the coin, in place of some initial letters of titles, which not one person in a thousand can decipher; and to make the coin of as compact a form as possible, diminishing the surface of it as much as is consistent with beauty.

6. That it shall be lawful for all contracting parties to stipulate their payments either in gold or silver coin, or to leave the option of the species to one of the parties.

7. That where no particular stipulation is made, creditors shall have power to demand payment, half in one species, half in the other; and when the sum cannot fall equally into gold and silver coins, the fractions to be paid in silver.

8. That in buying and selling, when no particular species has been stipulated, and when no act in writing has intervened, the option of the species shall be competent to the buyer.

9. That all sums paid or received by the King’s receivers, or by bankers, shall be delivered by weight, if demanded.

10. That all money which shall be found under the legal weight, from whatever cause it may proceed, may be rejected in every payment whatsoever; or if offered in payment of a debt above a certain sum, may be taken according to its weight, at the then mint price, in the option of the creditor.

11. That no penalty shall be incurred by those who melt down or export the nation’s coin; but that washing, clipping, or diminishing the weight of any part of it shall be deemed felony, as much as any other theft, if the person so degrading the coin shall afterwards make it circulate for lawful money.

To prevent the inconveniences proceeding from the variation in the proportion between the metals, it may be provided,

12. That upon every variation of proportion in the rise in denomination, the annuities charged upon them shall be regulated according to the following rule.

Let the price of the pound troy fine gold in the coin be called \( G \).

13. That no penalty shall be incurred by those who melt down or export the nation’s coin; but that washing, clipping, or diminishing the weight of any part of it shall be deemed felony, as much as any other theft, if the person so degrading the coin shall afterwards make it circulate for lawful money.

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To prevent the inconveniences proceeding from the variation in the proportion between the metals, it may be provided,
Let the guinea be called $G$. Let the difference between the old proportion and the new, which is $\frac{1}{20}$, be called $P$. Then lay,

$$S - \frac{P}{2} = \text{a pound sterling}, \quad \text{and } G + \frac{P}{2} = \text{a pound sterling}.$$

By this it appears that all the silver coin must be raised in its denomination $\frac{1}{20}$, and all the gold coin must be lowered in its denomination $\frac{1}{20}$; yet still $S + G$ will be equal to two pounds sterling, as before, whether they be considered according to the old, or according to the new denominations.

But it may be observed, that the imposition of coinage rendering the value of the coin greater than the value of the bullion, that circumstance gives a certain latitude in fixing the new denominations of the coin, so as to avoid minute fractions. For, providing the deviation from the exact proportion shall fall within the advanced price of the coin, no advantage can be taken by melting down one species preferably to another; since, in either case, the losses incurred by melting the coin must be greater than the profit made upon selling the bullion. The mint price of the metals, however, may be fixed exactly, that is, within the value of a farthing upon a pound of fine silver or gold. This is easily reckoned at the mint; although upon every piece in common circulation the fractions of farthings would be inconvenient.

15. That notwithstanding the temporary variations made upon the denomination of the gold and silver coins, all contracts formally entered into, and all stipulations in pounds shillings and pence, may continue to be acquit according to the old denominations of all foreign money of account, except as bullion at the actual price of the mint, or refused at the option of the creditor.

16. That notwithstanding the alterations on the mint price of the metals, and in the denomination of the coins, no change shall be made upon the weight of the particular pieces of the latter, except in the case of a general recoining of one denomination at least: that is to say, the mint must not coin new guineas, crowns, &c., of a different weight from those already in currency, although by so doing the fractions might be avoided. This would occasion confusion, and the remedy would cease to be of any use upon a new change in the proportion of the metals. But it may be found convenient, for removing the small fractions in shillings and sixpences, to recoin such denominations all together, and to put them to their integer numbers, of twelve and of six pence, without changing in any respect their proportion of value to all other denominations of the coin: this will be no great expense, when the bulk of the silver coin is put into 5 shilling pieces.

By this method of changing the denominations of the coin, there never can result any alteration in the value of the pound sterling: and although fractions of value may now and then be introduced, in order to prevent the abuses to which the coin would otherwise be exposed by the artifice of those who melt it down, yet still the inconvenience of such fractions may be avoided in paying, according to the old denominations, in both species, by equal parts. This will also prove demonstratively, that no change is thereby made in the true value of the national unit of money.

17. That it be ordered, that shillings and sixpences shall only be current for twenty years, and all other coins, both gold and silver, for forty years, or more. For ascertaining which term, there may be marked, upon the exergue of the coin, the last year of their currency, in place of the date of their fabrication. This term elapsed, or the date effaced, that they shall have no more currency whatsoever; and when offered in payment, may be received as bullion at the actual price of the mint, or refused at the option of the creditor.

18. That no foreign coin shall have any legal currency, except as bullion at the mint price.

By these or the like regulations may be prevented, 1. The melting or exporting of the coin in general, 2. The melting or exporting one species, in order to sell it as bullion, at an advanced price. 3. The profit in acquiring obligations preferably in one species to another. 4. The degradation of the standard, by the wearing of the coin, or by a change in the proportion between the metals. 5. The circulation of the coin below the legal weight. 6. The profit that other nations reap by paying their debts more cheaply to Great Britain than Great Britain can pay hers to them. And the great advantage of it is, that it is an uniform plan, and may serve as a perpetual regulation, compatible with all kinds of denominations of coins, variations in the proportion of the metals, and with the imposition of a duty upon coinage; or with the preferring it free; and further, that it may in time be adopted by other nations, who will find the advantage of having their money of account preferred perpetually at the same value, with respect to the denominations of all foreign money of account established on the same principles.

TABLE
<table>
<thead>
<tr>
<th>Dutch Coins</th>
<th>German Coins</th>
<th>French Coins</th>
<th>English Coins</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Fa.</td>
<td>50 Pfenn.</td>
<td>5 Sols</td>
<td>10 Shillings</td>
</tr>
<tr>
<td>2 Fa.</td>
<td>100 Pfenn.</td>
<td>10 Sols</td>
<td>20 Shillings</td>
</tr>
<tr>
<td>5 Fa.</td>
<td>500 Pfenn.</td>
<td>50 Sols</td>
<td>100 Shillings</td>
</tr>
<tr>
<td>10 Fa.</td>
<td>1000 Pfenn.</td>
<td>100 Sols</td>
<td>200 Shillings</td>
</tr>
</tbody>
</table>

The above coins are not considered to be of the same weight; and the coins in
3½ oz. Troy weight, from their weight in comparison with those of other countries, according to the following proportions:

The number of grains of each metal in every coin is given in the regulations of the mint of the country where it is coined, and is expressed in the grains in

### Table of Coins Reduced to Grains of Fine Metal, according to the

#### TABLE OF COINS,
MONK, a person who wholly dedicates himself to the service of religion, in some monastery, under the direction of some particular rules and rules.

The most probable account of the original of the monks is, that in the Decian persecution, in the middle of the third century, many persons in Egypt, to avoid the fury of the storm, fled to the neighboring deserts and mountains, where they not only found a safe retreat, but also more time and liberty to exercise themselves in acts of pious and divine contemplations; which sort of life became so agreeable, that when the persecution was over, they refused to return to their habitations again, choosing rather to continue in these cottages and cells, which they had made for themselves in the wilderness. From that time to the reign of Constantine, monachism was confined to the hermits or anchorites, who lived in private cells in the wilderenss; but when Pachominus had erected monasteries, other countries presently followed the example.

MONKEY, in zoology. See Simia.

MONMOUTH, the capital of Monmouth-shire, situated on the river Wye, twenty-five miles north of Bristol.

MONOCHORD, a musical instrument, composed of one string, used to try the variety and proportion of sounds.

MONOCULUS, in zoology, a genus of the order of aperta. The feet are fitted for swimming; the body is covered with a crustaceous skin; and the eyes are very near each other. There are nine species.

MONODON, in ichthyology, a genus of fishes belonging to the order of benth. It has a long wreathed tooth in the upper jaw, which perforates the upper-lip, and has the appearance of a horn; from this circumstance it has got the name of the unicorn-fish. This fish is of the whale kind, and often grows to 25 feet in length, though the general size is from 16 to 20.

MONODY, in ancient poetry, a mournful kind of song, sung by a person alone, to give vent to his grief.

MONOECLA, in botany. See Botany, p. 635.

MONOGAMY, the state or condition of those who have only been once married, and are restrained to a single wife.

MONOGRAM, a character or cypher, composed of one letter, more letters, interwoven; being a kind of abbreviation of a name, anciently used as a seal, badge, arms, &c.

MONOLOGUE, in poetry, a dramatic scene, in which a person appears alone on the stage, and speaks to himself.

MONOMOTOPA, a country of Africa, bounded by Monemugi on the north, and by Caffaria on the east, south, and west.

MONOPETALOUS, in botany, a term applied to flowers that have only one petal, or flower-leaf.

MONOPOL, a town in the kingdom of Naples, situated on the gulf of Venice: E. long. 18°, and N. lat. 4° 5'.

MONOPOLY, one or more persons making themselves the sole makers of the whole of a commodity, manufacture, and the like, in order to make private advantage of it, by selling it again at a very advanced price.

MONOPYRENEOUS, in botany, such fruit as contains only one seed, or kernel.

MONOSTICH, an epigram that consists of only one line verse.

MONOSYLLABLE, in grammar, a word that consists of only one syllable, and is composed of either one or more letters pronounced at the same time.

MONOTONY, an uniformity of sound, or a fault in pronunciation, when a long series of words are delivered in one unvaried tone.

MONOTROPA, in botany, a genus of the decandria monogynia class. It has no calyx; the petals are ten; and it has five capsules. There are two species, one of which, viz. the hypopithys, or bird's nest-smelling, like the roots of the primrose, is a native of Britain.

MONS, the capital of the province of Hainaut, in the Austrian Netherlands: situated twenty-six miles south-west of Brussels: easterly long. 3° 33', and southerly lat. 50° 34'.

MONSIEUR, a title of civility used by the French, in speaking to, or of their equals, or those that are but a little below them, synonymous with Sir in English.

MONSOON, in physiology, a species of trade wind, in the East-Indies, which for six months blows conjunctly the same way, and in the contrary way the other six months. See Pneumatics, Of Winds.

MONSTER, in general, denotes any production that deviates from the species to which it belongs, whether with respect to the number or disposition of its parts; in which sense, a man with six fingers on each hand, or six toes on each foot, is a monster. But the term monster seems to be chiefly applied to such productions as deviate very much from the ordinary course of nature.

MONTE SANTO, or MOUNT-ATHOS, a mountain of European Turkey, in the province of Macedonia: E. long. 23°, and N. lat. 40° 12'.

It is called Monte Sancto, or Holy Mountain, from twenty two monasteries situated upon it, in which are four thousand monks or friars, who never suffer a woman to come within sight of their convent.

MONTFERRAT, a duchy in Italy, bounded by the lordship of Vercell on the north, by the Alexandr in on the east, by the territory of Genoa on the south, and by the county of Afti on the west.

MONTFORT, the capital of the county of Montfort, in the circle of Swabia, in Germany: E. long. 9° 40', and N. lat. 47° 15'.

MONTGOMERY, the capital of Montgomeryshire, in Wales, situated on the river Severn, twenty miles south-west of Shrewsbury.

MONTH, the twelfth part of a year. See Astronomy.

MONTIA, in botany, a genus of the triandria trigynia class. The calyx consists of one leaf, and the corolla of one irregular petal; and the capsule has one cell and three valves. There is but one species, viz. the lentana, or water chickweed, a native of Britain.
MORAL PHILOSOPHY, or MORALS.

MORAL PHILOSOPHY is "The science of manners or duty; which it traces from man's nature and condition, and shews to terminate in his happiness." In other words, it is "The knowledge of our duty and felicity;" or, "The art of being virtuous and happy."

It is denominated an art, as it contains a system of rules for becoming virtuous and happy. Whoever practice or defigns rules, attains an habitual power or facility of performing virtuous and happy actions. It is likewise called a science, as it deduces those rules from the principles and connexions of our nature, and proves that the observance of them is productive of our happiness.

It is an art, and a science, of the highest dignity, importance, and use. Its object is man's duty, or his conduct in the several moral capacities and connections which he sustains. Its office is to direct or decide that conduct; to shew whence our obligations arise, and where they terminate. Its use, or end, is the attainment of happiness; and the means it employs are rules for the right conduct of our moral powers.

Moral Philosophy has this in common with Natural Philosophy, that it appeals to nature or fact; depends on observation; and builds its reasonings on plain uncontroverted experiments, or upon the fullest induction of particulars of which the subject will admit. We must observe, in both these sciences, how nature is affected, and what her conduct is in such and such circumstances. Or,

in other words, we must collect the appearances of nature in any given instance; trace these to some general principles, or laws of operation; and then apply these principles or laws to the explaining of other phenomena.

Therefore Moral Philosophy inquires, not how man might have been, but how he is, constituted: not into what principles or dispositions his actions may be artfully resolved; but from what principles and dispositions they actually flow: not what he may, by education, habit, or foreign influence, come to be, or do; but what, by his nature, or original constituent principles, he is formed to be and do. We discover the office, use, or definition of any work, whether natural or artificial, by observing its structure, the parts of which it consists, their connection or joint action. It is thus we understand the office and use of a watch, a plant, an eye, or hand. It is the same with a living creature, of the rational, or brute kind. Therefore, to determine the office, duty, or definition of a man; or, in other words, what his business is, or what conduct he is obliged to pursue; we must inspect his constitution, take every part to pieces, examine their mutual relations, serve to the other, and the common effort or tendency of the whole.

Of Man and his connections.

Man is born a weak, helpless, delicate creature; unsaved, unprovided with food, clothing, and whatever else is necessary for subsistence, or defence. And yet, exposed as he

by MONTIFRINGILLA, in zoology. See Fringilla.

MONTPELIER, a city of France, in the province of Languedoc and county of Nîmes, situated on the little river Lez, fifty miles north-east of Narbonne, and forty-five miles south-west of Avignon; a place famous for its delightful situation, and its healthy serene air.

MONTREAL, a city of Sicily, in the province of Messara, situated near the sea, five miles east of Palermo.

MONTROSE, a town of North Britain, in the shire of Angus, situated at the mouth of the river Elk, on the German ocean, forty-six miles north-east of Edinburgh.

Steel spaws are very numerous in the country about Montrose; besides these, there is a well near this town whose water is of a whitish colour, soft taste, and faintly discovering a mineral quality, and is of a different nature from the steel one. It is universally diuretic; and has been found useful in stranguries, fluxes of urine, scrofulous disorders, flatulencies, &c.

MONTSEFRA is also a town of Canada, in North America, situated on the river St Laurence, one hundred miles south of Quebec.

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the infant is to numberless wants and dangers, he is utterly incapable of supplying the former, or securing himself against the latter. But, though thus feeble and exposed, he finds immediate and sure resources in the affection and care of his parents, who refuse no labours, and forego no dangers, to nurse and rear up the tender babe. By these powerful instincts, as by some mighty chain, does nature link the parent to the child, and form the strongest moral connection on his part, before the child has the least apprehension of it. Hunger and thirst, with all the sensations that accompany or are connected with them, explain themselves by a language strongly expressive, and irresistibly moving. As the several senses bring in notices and informations of surrounding objects, we may perceive in the young spectator early signs of a growing wonder and admiration. Bright objects and striking sounds are beheld and heard with a fort of com-}
the wants of one period supplied by the capacities of another, and the weaknesses of one age tally to the passions of another.

Besides these, there are other passions and affections of a less amulatory nature; not peculiar to one period, but belonging to every age; and acting more or less in every breath throughout life; such as, for love, benevolence, love of life, honour, shame, hope, fear, desire, aversion, joy, sorrow, anger, and the like. The two first are affections of a cooler strain; one pointing to the good of the individual, the other to that of the species: joy, and sorrow, hope and fear, seem to be only modifications, or different exertions of the same original affections of love and hatred, desire and aversion, arising from the different circumstances or position of the object desired or abhorred, as it is present or absent. From these likewise rise other secondary, or occasional passions, which depend, as to their existence and several degrees, upon the original affections being gratified or disappointed; as, anger, complacency, confidence, jealousy, love, hatred, objection, exaltation, contentment, disgust, which do not form leading passions, but rather hold of them.

By these simple, but powerful springs, whether periodical or fixed, the life of man, weak and indigent as he is, is preferred and secured; and the creature is prompted to a constant round of action, even to supply his own numerous and ever-returning wants, and to guard against the various dangers and evils to which he is obnoxious. By these links, men are connected with each other, formed into families, drawn into particular communities, and all united, as by a common league, into one system or body, whose members feel and sympathize one with another. By this admirable adjustment of the constitution of man to his frame, and the gradual evolution of his powers, order is maintained, society upheld, and human life filled with that variety of passion and action, which at once enliven and diversify it.

This is a short sketch of the principal movements of the human mind. Yet these movements are not the whole of man; they impel to action, but do not direct it; they need a regulator to guide their motions, to measure and apply their forces. And accordingly they have one that naturally superintends and directs their action. We are conscious of a principle within us, which examines, compares, and weighs things; notes the differences, observes the forces, and foresees the consequences of affections and actions. By this power we look back on past times, and forward into futurity, gather experiences, estimate the real and comparative value of objects, lay out schemes, contrive means to execute them, and settle the whole order and economy of life. This power we commonly distinguish by the name of reason, or reflection; the business of which is, not to haggle any original notices or sensations, but to canvass, range, and make deductions from them.

We are intimately conscious of another principle within us, which approves of certain sentiments, passions, and actions, and disapproves of their contraries. In consequence of the decisions of this inward judge, we denominate some actions and principles of conduct right, beneficent, good; and others wrong, dishonest, ill. The former ex-
fignation of man, the having analyzed the principles of which he is composed. It is necessary, in the next place, to consider in what order, proportion, and measure of those inward principles, virtue, or a found moral temper and right conduct, consids; that we may discover whence moral obligations arise.

Of Duty, or Moral Obligation.

It is by the end or design of any power or movement, that we must direct it motions, and estimate the degree of force necessary to its just action. If it want the force requisite for the obtaining its end, we reckon it defective; if it has too much, so as to be carried beyond it, we say it is overcharged; and in either case it is imperfect, and ill contrived. If it has just enough to reach the scope, we esteem it right, and as it should be. Let us apply this reasoning to the passions.

The defence and security of the individual being the aim of the defensive passions, that security and defence must be the measure of their strength or indulgence. If they are so weak as to prove insufficient for that end, or if they carry us beyond it, i.e., raise unnecessary commotions, or continue longer than is needful, they are unfit to answer their original design, and therefore are in an unfound and unnatural state. The exercise of fear or of resentment has nothing desirable in it, nor can we give way to either without painful sensations. Without a certain degree of them, we are naked and exposed: with too high a proportion of them, we are miserable, and often injurious to others. Thus cowardice or timidity, which is the excess of fear, instead of saving us in danger, gives it too formidable an appearance, makes us incapable of attending to the best means of preservation, and disarms us of courage our natural armour. Fool-hardiness, which is the want of the due measure of fear, leads us heedlessly into danger, and lulls us into a pernicious security. Revenge, i.e., excessive resentment, by the violence of its commotion, robs us of that presence of mind which is often the best guard against injury, and inclines us to pursue the aggressor with more severity than self-defence requires. Puffillanimity, or the want of a just indignation against wrong, leaves us quite unguarded, and tends to sink the mind into a passive enervated tameness. Therefore, "to keep the defensive passions duly proportioned to our dangers, is their natural pitch and tenor."

The private passions lead us to pursue some positive species of private good. That good, therefore, which is the object and end of each, must be the measure of their respective force, and direct their operation. If they are too weak or flagitious to engage us in the pursuit of their several objects, they are evidently deficient; but if they defeat their end by their impetuosity, then are they strained beyond the just tone of nature. Thus vanity, or an excessive passion for applause, betrays into such mean and little arts of popularity, as makes us forfeit the honour we so anxiously court. On the other hand, a total indifference about the esteem of mankind, removes a strong guard and spur to virtue, and lays the mind open to the most abandoned professions. Therefore, "to keep our private passions and desires proportioned to our wants, is the just measure and pitch of this class of affections."

The defensive and private passions do all agree in general in their tendency or conduciveness to the interest or good of the individual. Therefore, when there is a collision of interests, as may sometimes happen, that aggregate of good or happiness, which is composed of the particular goods to which they respectively tend, must be the common standard by which their comparative degrees of strength are to be measured. That is to say, if any of them, in the degree in which they prevail, are incompatible with the greatest aggregate of good, or most extensive interest of the individual, then are they unequal and disproportionate. For, in judging of a particular system or conjunction of powers, we call that the supreme or principal end, in which the aims of the several parts or powers coincide, and to which they are subordinate; and reckon them in due proportion to each other, and right with regard to the whole, when they maintain that subordination or suberviency. Therefore, "to proportion our defensive and private passions in such measure to our dangers and wants, as belt to secure the individual, and obtain the greatest aggregate of private good or happiness, is their just balance or comparative standard in case of competition."

In like manner, as the public or social affections point at the good of others, that good must be the measure of their force. When a particular social affection, as gratitude or friendship, which belongs to a particular social connection, viz. that of a benefactor or of a friend, is too feeble to make us act the grateful or friendly part; that affection, being insufficient to answer its end, is defective and unfound. If, on the other hand, a particular passion of this class counteracts or defeats the interest it is designed to promote, by its violence or disproportion, then is that passion excessive and irregular. Thus natural affection, if it degenerates into a passionate fondness, not only renders the parents from judging coolly of the interest of their offspring, but often leads them into a most partial and pernicious indulgence.

As every kind affection points at the good of its particular object, it is possible there may be sometimes a collision of interests or goods. Thus the regard due to a friend may interfere with that which we owe to a community. In such a competition of interests, it is evident, that the greatest is to be chosen; and that is the greatest interest, which contains the greatest sum or aggregate of public good, greatest in quantity as well as duration. This then is the common standard, by which the respective forces and subordinations of the social affections must be adjusted. Therefore we conclude, that this "class of affections are found and regular, when they prompt us to pursue the interest of individuals in an entire consistency with the public good;" or, in other words, "when they are duly proportioned to the dangers and wants of others, and to the various relations in which we stand to individuals, or to society."

Thus we have found, by an induction of particulars, the natural pitch or tenor of the different orders of affection, considered apart by themselves. Now as the virtue or perfection of every creature lies in following its nature,
or acting suitably to the just proportion and harmony of its several powers; therefore, "the virtue of a creature endowed with such affections as man, must consist in observing or acting agreeably to their natural pitch and tenor."

But, as there are no independent affections in the fabric of the mind, no passion that stands by itself without some relation to the rest, we cannot pronounce of any one, considered apart, that it is either too strong or too weak. Its strength and just proportion must be measured, not only by its subserviency to its own immediate end, but by the respect it bears to the whole system of affection. Therefore, we say a passion is too strong, not only when it defeats its own end, but when it impairs the force of other passions, which are equally necessary to form a temper of mind suited to a certain economy or state; and too weak, nor merely on account of its insufficiency to answer its end, but because it cannot sustain its part or office in the balance of the whole system. Thus the love of life may be too strong, when it takes from the regard due to one’s country, and will not allow one bravely to encounter dangers, or even death, on its account. Again, the love of fame may be too weak, when it throws down the fences which render virtue more secure, or weakens the incentives which make it more active and public-spirited.

If it be asked, "How far may the affections towards private good or happiness be indulged?" one limit was before fixed for the particular indulgencies of each, viz. their subordination to the common aggregate of good to the private system. In these, therefore, a due regard is always supposed to be had to health, reputation, fortune, the freedom of action, the unimpaired exercise of reason, the calm enjoyment of one’s self, which are all private goods. Another limit now results from the balance of affection just named, viz. "The security and happiness of others;" or, to express it more generally, "a private affection may be safely indulged, when, by that indulgence, we do not violate the obligations which result from our higher relations, or public connections."

A just respect therefore being had to these boundaries, which nature has fixed in the breast of every man, What should limit our pursuits of private happiness? Is nature sullen and penurious? Or does the God of nature envy the happiness of his offspring?

Whether there is ever a real collision of interests between the public and private system of affections, or the ends which each class has in view, will be afterwards considered; but where there is no collision, there is little or no danger of carrying either, but especially the public affection, to excess, provided both kinds are kept subordinate to a different and cool self-love, and to a calm and universal benevolence; which principles stand as guards at the head of each system.

This then is the conduct of the passions, considered as particular and separate forces, carrying us out to their respective ends; and this is their balance or economy, considered as compound powers, or powers mutually related, acting in conjunction towards a common end, and consequently as forming a system or whole.

Now, whatever adjusts or maintains this balance, whatever in the human constitution is formed for directing the passions, so as to keep them from defeating their own end or interfering with each other, must be a principle of a superior nature to them, and ought to direct their measures, and govern their proportions. But it was found, that reason or reflection is such a principle, which points out the tendency of our passions, weighs their influence upon private and public happiness, and shews the best means of attaining either. It having been likewise found, that there is another directing or controlling principle, which we call conscience, or the moral sense, which, by a native kind of authority, judges of affections and actions, pronouncing some just and good, and others unjust and ill; it follows, that the passions, which are mere impulses, or blind forces, are principles inferior and subordinate to this judging faculty. Therefore, if we would observe the mutual respects and the subordination which the different parts of the human constitution bear one to another, the passions ought to be subjected to the direction and authority of the leading or controlling principles.

We conclude therefore from this induction, that "the constitution or just economy of human nature consists in a regular subordination of the passions and affections to the authority of conscience, and the direction of reason."

That subordination is regular, when the proportion formerly mentioned is maintained; that is to say, "When the defensive passions are kept proportioned to our dangers; when the private passions are proportioned to our wants; and when the public affections are adapted to our public connections, and proportioned to the wants and dangers of others."

But the natural state, or the found and vigorous constitution, of any creature, or the just economy of its powers, we call its health and perfection; and the acting agreeably to these, its virtue or goodness. Therefore, " the health and perfection of man must lie in the aforesaid supremacy of conscience and reason, and in the subordination of the passions to their authority and direction; and his virtue or goodness must consist in acting agreeably to that order or economy."

That such an economy of the mind, and such a conduct of its power and passions, will stand the test of reason, cannot admit of any dispute. For, upon a fair examination into the consequences of things, or the relations and aptitudes of means to ends, reason evidently demonstrates, and experience confirms it, that "to have our defensive passions duly proportioned to our dangers, is the surest way to avoid or get clear of them, and obtain the security we seek after." — "To proportion our private passions to our wants, is the best means to supply them;—and, to adapt our public affections to our social relations and the good of others, is the most effectual method of fulfilling one, and procuring the other." In this sense, therefore, virtue may be said to be a "conduct conformable to reason, as reason discovers an apparent aptitude in such an order and economy of powers and passions to answer the end for which they are naturally formed."

If the idea of moral obligation is to be deduced merely from this aptitude or connection between certain passions, or a certain order and balance of passions, and certain ends
ends obtained or to be obtained by them; then is reason
or reflection, which perceives that aptitude or connection,
the proper judge of moral obligation; and on this
supposition it may be defined, "the connection between the
affection and the end, or between the action and the mo-
tive;" for the end is the motive, or the final cause; and
the affection is the action, or its immediate natural cause.
A man, from mere self love, may be induced to fulfil that
obligation which is founded on the connection between the
defensive passions and their ends, or the private passions
and their ends; because, in that case, his own interest
will prompt him to indulge them in the due proportion
required. But if he has no affections which point
beyond himself, no principle but self-love or some subtle
modification of it, what shall interest him in the happiness
of others, where there is no connection between it and
his own? or what sense can he have of moral obligation
to promote it? Upon this scheme therefore, without pub-
lick or social affections there could be no motive, and
consequently no moral obligation, to a beneficent disme-
relished conduct.

But the mere connection between certain passions, or
a certain order of passions, and certain ends, is what
constitutes or gives us the idea of moral obligation; then
why may not the appositeness of any temper or conduct,
nay, of any piece of machinery, to obtain its end, form
an equally strict moral obligation? For the connection
and aptitude are as strong and invariable in the latter
instances as in the former. But as this is confounding
the most obvious differences of things, we must trace
the idea of moral obligation to another and a more natu-
ral source.

Let us appeal therefore to sense and experience, "how
we stand affected to these different sets of passions in the
just measure and balance of which we found a right tem-
per to confult." For this is entirely a matter of expe-
rience, in which we must examine, as in any other natural
inquiry, "what are the genuine feelings and operations
of nature, and what affections or symptoms of them ap-
ppear in the given instance."

The defensive passions, as anger and fear, give us ra-
ther pain than pleasure; yet we cannot help feeling them
when provoked by injury or exposed to harm. We
account the creature imperfect that wants them, because
they are necessary to his defense. Nay, we should in
some measure condemn ourselves, did we want the nec-
essary degree of repentance and caution. But if our reten-
ment exceeds the wrong received, or our caution the e-
sy kind of sensation, to pursue the good of their re-
pective objects, as pity, natural affection, and the like;
and those calm dispassionate affections and desires which
prompt us more steadily and uniformly to promote the
happiness of others. The former we generally call pa-
fions; to distinguish them from the other fort, which go
more commonly by the name of affections, or calm de-
fires. The first kind we approve indeed, and delight in;
but we feel still higher degrees of approbation and moral
compliance towards the last, and towards all limitations
of the particular instincts, by the principle of universal
benevolence. The more objects the calm affections take
in, and the worthier these are, their dignity rises in pro-
portion, and with this our approbation keeps an exact
pace. A character, on the other hand, which is quite
diveiled of these public affections, which feels no love
for the species, but, instead of it, entertains malice, ra-
cour, and ill-will, we reckon totally immoral and unnatural.

Such then are the sentiments and dispositions we feel,
when these several orders of affection pass before the
mental eye.

Therefore, "that slate in which we feel ourselves mo-
ved, in the manner above described, towards those affec-
tions and passions, as they come under the mind's review,
in which we are infamnlaneous, and independently of
our choice or volition, prompted to a correspondent con-
duct, we call a slate of moral obligation." Let us sup-
pose, for instance, a parent, a friend, a benefactor, re-
duced
duced to a condition of the utmost indigence and distress, and that it is in our power to give them immediate relief. To what conduct are we obliged? what duty does nature dictate and require in such a case? Attend, and nature will tell with a voice irresistibly audible and commanding to the human heart, "that immediate relief ought to be given." Again, let a friend, a neighbour, or even a stranger, have lodged a deposit in our hands, and after some time reclaim it; no sooner do these ideas of the confidence reposed in us, and of property not transferred but deposited, occur, than we immediately and unavoidably feel and recognize the obligation to restore it. In both these cases, we should condemn ourselves, if we acted otherwise, as having done, or omitted doing, what we ought not;—as having acted beneath the dignity of our nature,—contrary to our most intimate sense of right and wrong,—we should accuse ourselves as guilty of ingratitude, injustice, and inhumanity;—and be conscious of deferving the censure, and therefore dread the resentment, of all rational beings. But in complying with the obligation, we feel joy and self-approbation,—are conscious of an inviolable harmony between our nature and duty,—and think ourselves entitled to the applause of every impartial spectator of our conduct.

To describe therefore what we cannot perhaps define, a state of moral obligation, is "that state in which a creature, endowed with such senses, powers, and affections as man, would condemn himself, and think he deserved the condemnation of all others, should he refuse to fulfill it; but would approve himself, and expect the approbation of all others, upon complying with it."

And we call him a moral agent, who is in such a state, or is subject to moral obligation. Therefore as man's structure and connections often subject him to such a state of moral obligation, we conclude that he is a moral agent. But as man may sometimes act without knowing what he does, as in cases of frenzy or disease, or in many natural functions; or, knowing what he does, he may act without choice or affection, as in cases of necessity or compulsion; therefore, to denominate an action moral, i.e. approveable, or blameable, it must be done knowingly and willingly, or from affection and choice. A morally good action, then, is "to fulfill a moral obligation knowingly and willingly;" and a morally bad action, or an immoral action, is "to violate a moral obligation knowingly and willingly."

As not an action, but a series of actions constitute a character; as not an affection, but a series of affections constitute a temper; and as we denominate things by the gros, à fortiori, or by the qualities which chiefly prevail in them: "therefore we call that a morally good character, in which a series of morally good actions prevail; and that a morally good temper, in which a series of morally good affections have the ascendant." A bad character and bad temper are the reverse. But where the above mentioned order or proportion of passions is maintained, there a series of morally good affections and actions will prevail. Therefore, "to maintain that order and proportion, is to have a morally good temper and character." But a "morally good temper and character" is moral rectitude, integrity, virtue, or the completion of duty.

If it be asked, after all, "How we come by the idea of moral obligation or duty?" we may answer, that we come by it in the same way as by our other original and primary perceptions. We receive them all from nature, or the great Author of nature. For this idea of moral obligation is not a creature of the mind, or dependent on any previous act of volition; but arises on certain occasions, or when certain other ideas are presented to the mind, as necessarily, instantaneously, and unavoidably, as pain does upon too near an approach to the fire, or pleasure from the fruition of any good. It does not, for instance, depend on our choice, whether we shall feel the obligation to succour a distressed parent, or to restore a deposit intrusted to us when it is recalled. We cannot call this a compound idea made up of one or more simple ideas. We may indeed, nay, we must, have some ideas antecedent to it, e.g. that of a parent—in distress—of a child—able to relieve—of the relation of one to the other,—of a trust,—of right, &c. But none of these ideas constitute the perception of obligation. These indeed, by a law of our nature, are the occasion of suggesting it; but they are as totally different from it, as colours are from sounds. By sense or reflection we perceive the correlative properties, our memory recalls the favours or deposits we received, the various circumstances of the case are matters of fact or experience; but some delicate inward organ or power, or call it what we please, does, by a certain instantaneous sympathy, antecedent to the cool deductions of reason, and independent of previous instruction, art, or volition, perceive the moral harmony, the living irresistible charm of moral obligation, which immediately interests the correspondent passions, and prompts us to fulfill its awful dictates.

We need not apprehend any danger from the quickness of its decisions; nor be frightened, because it looks like instinct, and has been called so. Would we approve one for deliberating long, or reasoning the matter much at leisure, whether he should relieve a distressed parent, feed a starving neighbour, or restore the trust committed to him? Should we not suspect the reasoner of knavery, or of very weak affections to virtue? We employ reason in examining the condition, relations, and other circumstances of the agent or patient, or of those with whom either of them are connected, or, in other words, the state of the case; and in complicated cases, where the circumstances are many, it may require no small attention to find the true state of the case: but when the relations of the agent or patient, and the circumstances of the actions, are obvious, or come out such after a fair trial, we should scarce approve him who demurs on the obligation to that conduct which the case suggets.

From what has been said it is evident, that it is not the pleasure or agreeable sensations which accompany the exercise of the several affections, nor those consequent to the actions, that constitute moral obligation, or excite in us the idea of it. That pleasure is posterior to the idea of obligation; and frequently we are obliged, and acknowledge ourselves under an obligation, to such affections...
We have now taken a general prospect of man, and of his moral powers and connections; and on these erected a scheme of duty, or moral obligation, which seems to be confirmed by experience, consonant to reason, and approved by his most inward and most sacred senses. It may be proper, in the next place, to take a more particular view of the final causes of those delicate springs by which he is impelled to action, and of those clogs by which he is restrained from it. By this detail we shall be able to judge of their aptitude to answer their end, in a creature endowed with his capacities, subject to his wants, exposed to his dangers, and susceptible of his enjoyments; and from thence, we shall be in condition to pronounce concerning the end of his whole structure, its harmony with his state, and consequently its subserviency to answer the great and benevolent intentions of its author.

The supreme being has been fit to blend in the whole of things a prodigious variety of discordant and contrary principles, light and darkness, pleasure and pain, good and evil. There are multifarious natures, higher and lower, and many intermediate ones between the wide-distant extremes. These are differently situated, variously adjusted, and subjected to each other; and all of them subordinate to the order and perfection of the whole. We may suppose man placed as in a centre amidst those innumerable orders of beings; by his outward frame drawn to the material system, and by his inward connected with the intellectual or moral, and of course affected by the laws which govern both, or affected by that good and all that ill which result from those laws. In this infinite variety of relations with which he is surrounded, and contingencies to which he is liable, he feels strong attractions to the good, and violent repulsions or aversions to the ill. But as good and ill are often blended, and wonderfully complicated one with the other; as they sometimes immediately produce and run up into each other, and at other times lie at great distances, yet, by means of intervening links, introduce one another; and as these effects are often brought about in consequence of hidden relations, and general laws, of the energy of which he is an incompetent judge; it is easy for him to mistake good for evil, and evil for good; and consequently he may be frequently attracted by such things as are destructive, or repel such as are salutary. Thus, by the tender and complicated frame of his body, he is subjected to a great variety of ills, to sickness, cold, heat, fatigue, and innumerable wants. Yet his knowledge is so narrow withal, and his reason so weak, that in many cases he cannot judge, in the way of investigation, or reasoning, of the connections of those effects with their respective causes, or of the various latent energies of natural things.

He is therefore informed of this connection by the experience of certain senses, or organs of perception, which, by a mechanical instantaneous motion, feel the good and the ill, receiving pleasure from one, and pain from the other. By these, without any reasoning, he is taught to attract or chuse what tends to his welfare, and to repel and avoid what tends to his ruin. Thus, by his senses of taste and smell, or by the pleasure he receives from certain kinds of food, he is admonished which agree with his constitution, and, by an opposite sense of pain, he is informed which forts disagree, or are destructive of it; but is not by means of these instructed in the inward natures and constitutions of things.

Some of those senses are armed with strong degrees of uneasiness or pain, in order to urge him to seek after such objects as are suited to them. And these respect his more immediate and pressing wants; as the sense of hunger, thirst, cold, and the like; which by their painful importunities, compel him to provide food, drink, raiment, and shelter. Those instincts by which we are thus prompted, with some kind of commotion or violence, to attract and pursue good, or to repel and avoid ill, we call appetites and passions. By our senses then we are informed of what is good or ill to the private system, or the individual; and by our private appetites and passions we are impelled to one, and restrained from the other.

In consequence of this machinery, and the great train of wants to which our nature subjects us, we are engaged in a continued series of occupations, which often require much application of thought, or great bodily labour, or both. The necessaries of life, food, cloaths, shelter, and the like, must be provided; conveniences must be acquired to render life still more easy and comfortable. In order to obtain these, arts, industry, manufactures, and trade are necessary: and to secure to us the peaceable enjoyment of their fruits, civil government, policy, and laws must be contrived, and the various business of public life carried on. Thus while man is concerned and busied in making provision, or obtaining security for himself, he is by degrees engaged in connections with a family, friends, neighbours, a community, or a commonwealth. Hence arise new wants, new interests, new cares, and new employments. The passions of one man interfere with those of another. Interests are opposed. Competitions arise; contrary courses are taken. Disappointments happen, distractions are made; and parties formed. This opens a vast scene of distraction and embarrassment, and introduces a mighty train of good and ill, both public and private. Yet amidst all this confusion and hurry, plans of action must be laid, consequences foreseen or guarded against, inconveniences provided for; and frequently particular resolutions must be taken, and schemes executed, without reasoning or delay.

Now, what provision has the Author of our nature made for this necessitous condition? How has he fitted the actor, man, for playing his part in this perplexed and busy scene?

Our supreme Parent, watchful for the whole, has not left himself without a witness here neither, and hath made nothing imperfect, but all things are double one against another. He has not left man to be informed, only by the cool notices of reason, of the good or ill, the happiness or misery of his fellow creatures. He has made
made him sensible of their good and happiness, but especially of their ill and misery, by an immediate sympathy, or quick feeling of pleasure and of pain.

The latter we call pity or compassion. For the former, though every one who is not quite divested of humanity feels it in some degree, we have not got a name, unless we call it congratulation, or joyful sympathy, or that good humour which arises on seeing others pleased or happy. Both these feelings have been called, in general, the public or common sense, by which we feel for others, and are interested in their concerns as really, though perhaps less sensibly, than in our own.

When we see our fellow-creatures unhappy through the fault or injury of others, we feel resentment or indignation against the unjust causes of that misery. If we are conscious that it has happened through our fault or injurious conduct, we feel shame; and both these classes of senses and passions, regarding misery and wrong, are armed with such sharp sensations of pain, as not only prove a powerful guard and security to the species, or public system, against these ills it may, but serve also to lessen or remove those ills it does, suffer.

Compassion draws us out of ourselves to bear a part of the misfortunes of others, powerfully solicits us in their favour, melts us at sight of their distress, and makes us in some degree unhappy till they are relieved from it. It is peculiarly well adapted to the condition of human life, because it is more and oftener in our power to do mischief than good, and to prevent or lessen misery than to communicate positive happiness; and therefore it is an admirable restraint upon the more selfish passions, or those violent impulses that carry us to the hurt of others.

There are other particular instincts or passions, which interest us in the concerns of others, even while we are most busy about our own, and which are strongly attractive of good, and repulsive of ill to them. Such are natural affection, friendship, love, gratitude, desire of fame, love of society, of one's country. Now as the private appetites and passions were found to be armed with strong sensations of desire and uneasiness, to prompt man the more effectively to sustain labours, and encounter dangers, in pursuit of those goods that are necessary for the preservation and welfare of the individual, and to avoid those ills which tend to his destruction; in like manner it was necessary that this other class of desires and affections should be prompted with as quick sensations of pain, not only to counteract the strength of their antagonists, but to engage us in a virtuous activity for our relations, families, friends, neighbours, country. Indeed our sense of right and wrong will admonish us that it is our duty, and reason and experience further assure us that it is both our interest and security, to promote the happiness of others; but that sense, that reason, and that experience, would frequently prove but weak and ineffectual prompters to such a conduct, especially in cafes of danger and hardship, and amidst all the importunities of nature, and that constant hurry in which the private passions involve us, without the aid of those particular kind affections, which mark out to us particular spheres of duty, and with an agreeable violence engage and fix us down to them.

It is evident therefore, that these two classes of affection, the private and public, are set one against the other, and designed to control and limit each other's influence, and thereby to produce a just balance in the whole. In general, the violent sensations of pain or uneasiness which accompany hunger, thirst, and the other private appetites, or too great fatigue of mind as well as of body, prevent the individual from running to great excesses in the exercise of the higher functions of the mind; as too intense thought in the search of truth, violent application to business of any kind, and different degrees of romantic heroism. On the other hand, the finer senses of perception, and those generous desires and affections which are connected with them, the love of action, of imitation, of truth, honour, public virtue, and the like, are wisely placed in the opposite scale, in order to prevent us from sinking into the dregs of the animal life, and debasing the dignity of man below the condition of brutes. So that by the mutual reaction of those opposite powers, the bad effects are prevented that would naturally result from their acting singly and apart; and the good effects are produced which each are severally formed to produce.

The same wholesome opposition appears likewise in the particular counterworkings of the private and public affections one against the other. Thus compassion is adapted to counterpoise the love of ease, of pleasure, and of life; and to disarm, or to set bounds to resentment and resentment of injury done to ourselves or to our friends, prevents an effeminate compassion or confirmation; and gives us a noble contempt of labour, pain, and death. Natural affection, friendship, love of one's country, may, zeal for any particular virtue, are frequently more than a match for the whole train of selfish passions. On the other hand, without that intimate over-riding passion of self-love, and those private desires which are connected with it, the social and tender instincts of the human heart would degenerate into the wilderst dotage, the most torturing anxiety, and downright frenzy.

But not only are the different orders or classes of affection checks one upon another, but passions of the same classes are mutual clogs. Thus, how many are withheld from the violent outrages of resentment by fear? and how easily is fear controlled in its turn, while mighty wrongs awaken a mighty resentment? The private passions often interfere, and therefore moderate the violence of each other; and a calm self-love is placed at their head to direct, influence, and control their particular motions. Thus most part, if not all the passions have a twofold aspect, and serve a twofold end. In one view they may be considered as powers, impelling mankind to a certain course, with a force proportioned to the apprehended moment of the good they aim at. In another view they appear as weights balancing the action of the powers, and controlling the violence of their impulses. By means of these powers and weights a natural poise is settled in the human breast by its all-wise Author, by
by which the creature is kept tolerably steady and regular in his course, amidst that variety of changes through which he must pass.

But this is not all the provision which God has made for the hurry and perplexity of the scene in which man is destined to act. Amidst those infinite attractions and repulsions towards private and public good and ill, mankind either cannot often foresee the consequences or tendencies of all their actions towards one or other of these, especially where those tendencies are intricate and point different ways, or those consequences remote and complicated: or though, by careful and cool inquiry, and due improvement of their rational powers, they might find them out; yet distracted as they are with business, amused with trifles, dispirited by pleasure, and disturbed by passion, they either have, or can find, no leisure to attend to those consequences, or to examine how far this or that conduct is productive of private or public good on the whole. Therefore, were it left entirely to the flow of passions and other deductions of reason to trace those tendencies and make out those consequences, it is evident, that, in many particular instances, the business of life must stand still, and many important occasions of action be lost, or perhaps the greatest blunders be committed. On this account the Deity, besides that general approbation which we bestow on every degree of kind affection, has moreover implanted in man many particular perceptions, or determinations, to approve of certain qualities or actions, which, in effect, tend to the advantage of society, and are connected with private good, though he does not always see that tendency, nor mind that connection. And these perceptions or determinations do, without reasoning, point out, and, antecedent to views of interest, prompt to a conduct beneficial to the public, and useful to the private system. Such is that sense of candor and veracity, that abhorrence of fraud and falsehood, that sense of fidelity, justice, gratitude, greatness of mind, fortitude, clemency, decorum; and that disapprobation of knavery, injustice, ingratitude, meanness of spirit, cowardice, cruelty and indecorum, which are natural to the human mind. The former of those dispositions, and the actions flowing from them, are approved, and those of the latter kind disapproved by us, even abstracted from the view of their tendency or conduciveness to the happiness or misery of others or of ourselves. In one we discern a beauty, a superior excellency, a congruity to the dignity of man; in the other a deformity, a littleness, a debasement of human nature.

There are other principles also, connected with the good of society, or the happiness and perfection of the individual, though that connection is not immediately apparent, which we behold with real complacency and approbation, though perhaps inferior in degree, if not in kind; such as gravity, modesty, simplicity of deportment, temperance, prudent economy; and we feel some degree of contempt and dislike where they are wanting, or where the opposite qualities prevail. These and the like perceptions or feelings are either different modifications of the moral sense, or subordinate to it, and plainly serve the same important purpose, being expedient monitors in the several emergencies of a various and distracted life, of what is right, what is wrong, what is to be pursued, and what avoided; and, by the pleasant or painful conscientiousness which attends them, exerting their influence as powerful prompters to a suitable conduct.

From a slight inspection of the above-named principles, it is evident they all carry a friendly aspect to society and the individual, and have a more immediate or a more remote tendency to promote the perfection or good of both. This tendency cannot be always foreseen, and would be often mistaken, or else devoted to by a weak, busy, short-sighted creature, like man, both rash and variable in his opinions, a dupe to his own passions or to the designs of others, liable to sickness, to want, and to error. Principles, therefore, which are so nearly linked with private security and public good, by directing him, without operose reasoning, where to find one, and how to promote the other, and by prompting him to a conduct conducive to both, are admirably adapted to the exigencies of his present state, and wisely calculated to obtain the ends of universal benevolence.

It were easy, by considering the subject in another light, to shew, in a curious detail of particulars, how wonderfully the inside of man, or that allomining train of moral powers and affections with which he is endowed, is fitted to the several stages of that progressive and probationary state, through which he is destined to pass. As our faculties are narrow and limited, and rise from very small and imperfect beginnings, they must be improved by exercise, by attention, and repeated trials. And this holds true, not only of our intellectual, but of our moral and active powers. The former are liable to errors in speculation, the latter to blunders in practice, and both often terminate in misfortunes and pains: and those errors and blunders are generally owing to our passions, or to our too forward and warm admiration of those partial goods they naturally pursue, or to our fear of those partial ills they naturally repel. Those misfortunes therefore lead us back to consider where our misconduct lay, and whence our errors flowed; and consequently are salutary pieces of trial, which tend to enlarge our views, to correct and refine our passions, and consequently improve both our intellectual and moral powers.—Our passions then are the rude materials of our virtue, which heaven has given us to work up, to refine and polish into an harmonious and divine piece of workmanship. They furnish out the whole machinery, the calms and storms, the lights and shades of human life. They blew mankind in every attitude and variety of character, and give virtue both its struggles and its triumphs. To conduct them well in every state, is merit; to abuse or misapply them, is demerit.

The different sorts of senses, powers, and passions, which unfold themselves in those successive stages, are both necessary, and adapted to that rising and progressive state. Enlarging views and growing connections require new passions and new habits; and thus the mind, by these continually expanding and finding a progressive exercise, rises to higher improvements, and pushes forward to maturity and perfection.

In this beautiful economy and harmony of our structure, both outward and inward, with that state, we may at
at once discern the great lines of our duty, traced out in the fairest and brightest characters, and contemplate with admiration a more august and marvellous scene of divine wisdom and goodness hid in the human breast, than we shall perhaps find in the whole compass of nature.

From this detail it appears, that man, by his original frame, is made for a temperate, compassionate, benevolent, active, and progressive state. He is strongly attractive of the good, and repulsive of the ill, which befall others as well as himself. He feels the highest approbation and moral complacency in those affections and in those actions which immediately and directly respect the good of others, and the highest disapprobation and abhorrence of the contrary. Besides these, he has many particular perceptions or infinities of approbation, which though perhaps not of the same kind with the others, yet are accompanied with correspondent degrees of affection, proportioned to their respective tendencies to the public good. Therefore, by acting agreeably to these principles, man is agreeably to his structure, and fulfils the benevolent intentions of its Author.

The principal Distinctions of Duty or Virtue.

We have now considered the constitution and connections of man; and on these erected a general system of duty or moral obligation, consonant to reason, approved by his most sacred and intimate sense, suitable to his mixed condition, and confirmed by the experience of mankind. We have also traced the final causes of his moral faculties and affections to those noble purposes they answer with regard both to the private and the public system.

From this induction it is evident, that there is one order or class of duties which man owes to himself; another to society; and a third to God.

The duties he owes to himself are founded chiefly on the defensive and private passions, which prompt him to pursue whatever tends to private good or happiness, and to avoid or ward off whatever tends to private ill or misery. Among the various goods which allure and solicit him, and the various ills which attack or threaten him, "To be intelligent and accurate in selecting one, and rejecting the other, or in preferring the most excellent goods, and avoiding the most terrible ills, when there is a competition among either, and to be discreet in using the belt means to attain the goods and avoid the ills, is what we call prudence." This, in our inward frame, corresponds to sagacity, or a quickness of sense in our outward.—"To proportion our defensive passions to our dangers, we call fortitude," which always implies "a just mixture of calm resentment or animosity, and well governed caution." And this firmness of mind answers to the strength and muscling of the body.—And "duly to adjust our private passions to our wants, or to the respective moment of the good we affect or pursue, we call temperance;" which does therefore always imply "a just balance or command of the passions."

The second class of duties arises from the public or social affections; "the just harmony or proportion of which to the dangers and wants of others, and to the general relations we bear, commonly goes by the name of justice." This includes the whole of our duty to society, to its parent, and the general polity of nature; particularly gratitude, friendship, sincerity, natural affection, benevolence, and the other social virtues. The virtues comprehended under the former class, especially prudence and fortitude, may likewise be transferred to this; and according to the various circumstances in which they are placed, and the more confined or more extensive sphere in which they operate, may be denominated private, economical, or civil prudence, fortitude, &c. These direct our conduct with regard to the wants and dangers of those lesser or greater circles with which we are connected.

The third class of duties respects the Deity, and arises also from the public affections, and the several glorious relations which he sustains to us, as our creator, benefactor, law-giver, judge, &c.

We chose to consider this set of duties in the last place, because, though prior in dignity and excellency, they seem to be last in order of time, as thinking it the most simple and easy method to follow the gradual progress of nature, as it takes its rise from individuals, and spreads through the social system, and still ascends upwards, till at length it stretches to its almighty Parent and Head, and so terminates in those duties which are highest and best.

The duties resulting from these relations, are reverence, gratitude, love, resignation, dependence, obedience, worship, praise; which, according to the model of our finite capacities, must maintain some sort of proportion to the grandeur and perfection of the object whom we venerate, love, and obey. "This proportion or harmony, is expressed by the general name of piety or devotion," which is always stronger or weaker, according to the greater or less apprehended excellency of its object. This sublime principle of virtue, is the enlivening soul which animates the moral system, and that cement which binds and sustains the other duties which man owes to himself or to society.

This then is the general temper and constitution of virtue, and these are the principal lines or divisions of duty. To those good dispositions, which respect the several objects of our duty, and to all actions which flow from such dispositions, the mind gives its sanction or testimony. And this sanction or judgment concerning the moral quality, or the goodness of actions or dispositions, moralists call conscience. When it judges of an action that is to be performed, it is called an antecedent conscience; and when it passes sentence on an action which is performed, it is called a subsequent conscience. The tendency of an action to produce happiness, or its external conformity to a law, is termed its material goodness; but the good dispositions from which an action proceeds, or its conformity to law in every respect, constitutes its formal goodness.

When the mind is ignorant or uncertain about the moment of an action, or its tendency to private or public good; or when there are several circumstances in the case, some of which being doubtful, render the mind dubious concerning the morality of the action; this is called a doubtful or scrupulous conscience: if it mistakes concern-
Fig. 1. Mus Porcellus or Guinea Pig

Fig. 2. Mus Aguti

Fig. 3. Mus Avellonarius
Fig. 1. Mus Marmotta
or Alpin mouse.

Fig. 2. Mus Volans
or Flying Squirrel.

Fig. 3. Mustela Lutra or Otter.
Fig. 1. Mustela Putorius or Polecat.

Fig. 2. Mustela Furo or Ferret.

Fig. 4. Myrmecophaga.

Fig. 3. Mustela Ermina or Ermine.

Fig. 5. Mullet.
 reckoned innocent, or net imputable. If the error or cure one, or ward off the other, we feed neither defire out to, and ultimately refte in, the firft kind of obje&ts, rather than a diredt and immediate affedtion. All the o-a fubordinate manner, or with an incited!; and refledtive, pleafure nor pain, and are apprehended of no ufe to pro-
cal! averfion or hatred. To obje&ts which fuggeft neither judge wrong, as it often does, viz. Hy giving it proper science which errs ; for its fentence is always conformable to the view of the cafe which lies before it; and is juft, if thofe circumftances are fairly and fully ftated, the

If it be asked, "How an erroneous confcience fhall be rectified, fince it is fuppo ed to be the only guide of life, and judge of morals?" we answer, In the very fame way that we would rectify reafon, if at any time it fhould judge wrong, as it often does, viz. By giving it proper and fufficient materials for judging right, i.e. by inquiring into the whole flate of the cafe; the relations, connections, and feveral obligations of the actor; the confequences, and other circumftances of the action; or the fufpence of private or public good which results, or is likely to reft, from the action or from the omission of it. If thofe circumftances are fairly and fully flated, the confcience will be just and impartial in its decision. For, by a neceflary law of our nature, it approves, and is well affected to the moral form; and if it feme to approve of vice or immorality, it is always under the notion or mark of fome virtue. So that, strictly speaking, it is not confcience which errs; for its fentence is always conformable to the view of the cafe which lies before it; and is juft, upon the fuppofition that the cafe is truly fuch as it is re-

Of Man's Duty to Himself. Of the Nature & Good, and the chief Good.

Ev ery creature, by the conftitution of his nature, is determined to love himfelf, to purfu e whatever tends to his prefervation and happiness, and to avoid whatever tends to his hurt and misery. Being endued with fens and perception, he muft necessarily receive pleafure from fome obje&ts, and pain from others. Thofe obje&ts which give pleafure are called good, and thofe which give pain evil. To the former he feels that attraction or motion we call defire, or love: To the latter that impulse we call aversion or hatred. To obje&ts which fugges t neither pleafure nor pain, and are apprehended of no ufe to procure one, or ward off the other, we feel neither defire nor aversion; and fuch obje&ts are called indifferent. Thofe obje&ts which do not of themfev e felves produce pleafure or pain, but are the means of procuring either, we call ufeful or noxious. Towards them we are affected in a fubordinate manner, or with an indirect and refleктивive, rather than a diredt and immediate affedtion. All the o-

ving thefe, it is called an erroneous confcience. If the error or ignorance is involuntary or invincible, the action proceeding from that error, or from that ignorance, is reckoned innocent, or net imputable. If the error or ignorance is fupine or aected, i.e. the effect of negligence, or of affection and wilful inadvertence, the conduct flowing from fuch error, or fuch ignorance, is criminal and imputable. Not to follow one's confcience, though erroneous and ill-formed, is criminal, as it is the guide of life; and to counterfeit it, fhews a depraved and incorrigible spirit: Yet, to follow an erroneous confcience is likewise criminal, if that error which misled the confcience was the effect of inattention, or of any criminal affection.

But besides thofe forts of obje&ts which we call good, merely and solely as they give pleafure, or are means of procuring it, there is an higher and nobler fpecies of good, towards which we feel that peculiar movement we call approbation or moral complacency, and which we therefore denominate moral good. Such are our affections, and the confequent actions to them. The perception of this is quite diftinct in kind from the perception of the other fpecies; and though it may be connected with pleafure or advantage by the benevolent conftitution of nature, yet it constitutes a good independent of that pleafure and that advantage, and far superior, not in degree only, but in dignity, to both. The other, viz. the natural good, confists in obtaining thofe pleafures which are adapted to the peculiar fenes and paffions fuscceptible of them, and is as various as are thofe fenes and paffions. This, viz. the moral good, lies in the right con-
duct of the feveral fenes and paffions, or their juft proportion and accommodation to their respective obje&ts and relations; and this is of a more fimple and invariant kind.

By our feveral fenes we are capable of a great variety of pleafing fentations. Thofe constitute di@iue ends or obje&ts ultimately purfuable for their own fake. To thofe ends, or ultimate obje&ts, correpond peculiar appetites or affections, which prompt the mind to purfu e them. When thofe ends are attained, there it rests and looks no farther. Whatever therefore is purfuable, not on its own account, but as subfervient or neceffary to the at-
tainment of fomething elfe that is intrinifically valuable or for its own fake, we call a mean, and not an end. So that ends, and not means, confitute the materials or the very effence of our happiness. Confequently, happiness cannot be one fimple uniform thing in creatures conftituted, as we are, with fuch various fenes of pleafure, or fuch different capacities or enjoyment. Now, the fame principle or law of our nature which determines us to purfu e any one end or fpecies of good, prompts us to purfu e every other end or fpecies of good of which we are fuscceptible, or to which our Maker has adapted an origin-
al propenfion. But amidst the great multiplicity of ends or goods, which form the various ingredients of our happiness, we perceive an evident gradation or subdivision, futed to that gradation of fenes, powers, and paffions, which prevails in our mixed and various con-

Thus the goods of the body, or of the external fenes, feem to hold the lowest rank in this gradation of goods. Thofe we have in common with the brutes: and though many men are brutifh enough to purfu e the goods of the body with a more than brutal fury; yet when at any time they come in competition with goods of an higher order, the unanimous verdict of mankind, by giving the left the preference, condemns the firft to the

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meant greatest place. Goods consisting in exterior social connections, as fame, fortune, power, civil authority, seem to succeed next, and are chiefly valuable as the means of procuring natural or moral good, but principally the latter. Goods of the intellect are still superior; as taste, knowledge, memory, judgment, &c. The highest are moral goods of the mind, directly and ultimately regarding ourselves; as command of the appetites and passions, prudence, fortitude, benevolence, &c. These are the great objects of our pursuit, and the principal ingredients of our happiness. Let us consider each of them, as they rise one above the other in this natural series or scale, and touch briefly on our obligations to pursue them.

The first of the body are health, strength, agility, hardiness, and patience of change, neatness, and decency.

Good health, and a regular easy flow of spirits, are in themselves sweet natural enjoyments, a great fund of pleasure, and indeed the proper seasoning which gives a flavour and poignancy to every other pleasurable. The want of health unites us for most duties of life, and it especially renders the unhappy sufferer peevish and full of discontent at the allotments of providence, and consequently apt to entertain sordid and gloomy sentiments of its Author. It obliterates the free exercise and full improvement of our reason, makes us a burden to our friends, and useless to society. Whereas the uninterrupted enjoyment of good health, is a constant source of good humour; and good humour is a great friend to openness and benignity of heart; enables us to encounter the various ills and disappointments of life with more courage, or to sustain them with more patience; and, in short, conduces much, if we are otherwise duly qualified, to our acting our part in every exigency of life with more firmness, constancy, and dignity. Therefore it imports us much to preserve and improve an habit or enjoyment, without which every other external entertainment is tasteless, and most other advantages of little avail. And this is best done by a strict temperance in diet and regimen, by regular exercise, and by keeping the mind serene and unruffled by violent passions, and unfettered by intense and constant labours, which greatly impair, and gradually destroy, the strongest constitutions.

Strength, agility, hardiness, and patience of change, suppose health, and are unattainable without it; but they imply something more, and are necessary to guard it, to give us the perfect use of life and limbs, and to secure us against many otherwise unavoidable ills. The exercise of the necessary manual, and of most the elegant arts of life, depends on strength and agility of body; personal dangers, private and public dangers, the demands of our friends, our families and country require them; they are necessary in war, and ornamental in peace; fit for the employments of a country and a town life, and they exalt the entertainments and diversions of both. They are chiefly obtained by moderate and regular exercise.

Few are so much raised above want and dependence, or so exempted from business and care, as not to be often exposed to inequalities and changes of diet, exercise, air, climate, and other irregularities. Now, what can be so effectual to secure one against the mischiefs arising from such unavoidable alterations, as hardiness, and a certain versatilitv of constitution, which can bear extraordinary labours, and submit to great changes, without any fenible uneasiness or bad consequences. This is best attained, not by an over great delicacy and minute attentions to forms, or by an invariable regularity in diet, hours, and way of living, but rather by a bold different latitude of regimen. Besides, deviations from established rules in forms of living, if kept within the bounds of sobriety and reason, are friendly to thought and original sentiments, animate the dull scene of ordinary life and busines, and agreeably stir the passions, which stimulate or breed ill humour in the calms of life.

Neatness, cleanliness, and decency, to which we may add dignity of countenance and demeanour, seem to have something refined and moral in them. At least we generally esteem them indications of an orderly, genteel, and well governed mind, conscious of inward worth, or the respect due to one's nature. Whereas naiveté, looseness, awkwardness, and indecency, are presage symptoms of something mean, careless, and deficient, and betray a mind untaught, illiberal, unconscious of what is due to one's self or to others. How much cleanliness conduces to health needs hardly to be mentioned; and how necessary it is to maintain one's character and rank in life, and to render us agreeable to others as well as to ourselves, is as evident.—There are certain motions, airs and gestures, which become the human countenance and form, in which we perceive a comeliness, openness, simplicity, gracefulness; and there are others, which, to our sense of decorum, appear uncomely, affected, disingenuous, and awkward, quite unfitting to the native dignity of our face and form. The first are in themselves the most easy, natural, and commodious; give one boldness and preference of mind, a modest assurance, an address both awful and alluring, they bespeak candour and greatness of mind, raise the most agreeable prejudices in one's favour, render society engaging, command respect, and often love, and give weight and authority both in conversation and business: in fine, they are the colouring of virtue, which flew it to the greatest advantage in whomsoever it is; and not only imitate, but in some measure supply it where it is wanting. Whereas the last, viz. rudeness, affectedness, indecorum, and the like, have all the contrary effects; they are burdensome to one's self, a dishonour to our nature and a nuisance in society. The former qualities or goods are best attained by a liberal education, by preferring a judicious and improve an habit or enjoyment, without which every other external entertainment is tasteless, and most other advantages of little avail. And this is best done by a strict temperance in diet and regimen, by regular exercise, and by keeping the mind serene and unruffled by violent passions, and unfettered by intense and constant labours, which greatly impair, and gradually destroy, the strongest constitutions.

We are next to consider those goods which consist in exterior social connections; as fame, fortune, civil authority, power.

The first has a twofold aspect; as a good pleasance in itself, or gratifying to an original passion; and then, as expedient or useful towards a farther end. Honour from the wife and good, on the account of a virtuous conduct, is regaling to a good man. There are few quite indifferent even...
even to the commendation of the vulgar. Though we cannot approve that conduct which proceeds entirely from this principle, and not from good affection or love of the conduct itself; yet as it is often a guard and additional motive to virtue in creatures imperfect as we are, and often disfrigted by interfering passions, it might be dangerous to suppress it altogether, however wise it may be to restrain it within due bounds, and however laudable to use it only as a scaffolding to our virtue, which may be taken down when that glorious structure is finished, but hardly till then.

To pursue fame for itself, is innocent; to regard it only as an auxiliary to virtue, is noble; to seek it chiefly as an engine of public usefulness, is still more noble. For though the opinion and breath of men are transient and fading things; often obtained without merit, and lost without cause; yet as our business is with men, and as our capacity of serving them is generally increased in proportion to their esteem of us; therefore found and well established moral applause may, and will, modestly, not ostentatiously, flourish after by the good; not indeed as a solitary refined sort of luxury, but as a public and proper instrument to advance and embellish mankind. At the same time they will learn to despise that reputation which is founded on rank, fortune, and any other circumstances or accomplishments that are foreign to real merit, or to useful services done to others; and think that praise of little avail which is purchased without desert, and bestowed without judgment.

Fortune, power, and civil authority, or whatever is called influence and weight among mankind, are goods of the second division; that is, valuable and purchasable only as they are useful, or as means to a farther end, viz. the procuring or preferring the immediate objects of enjoyment or happiness to ourselves or others. Therefore, to love such goods on their own account, and to pursue them as ends, not the means of enjoyment, must be highly preposterous and absurd. There can be no measure, no limit to such pursuit; all must be whim, caprice, extravagance. Accordingly, such appetites, unlike all the natural ones, are increased by possession, and whetted by enjoyment. They are always precarious, and never without fears because the objects lie without one's self; they are seldom without sorrow and vexation, because no accession of wealth or power can satisfy them. But if those goods are considered only as the materials or means of private or public happiness; then the same obligations which bind us to pursue the latter, bind us likewise to pursue the former. We may, and no doubt we ought, to seek such a measure of wealth as is necessary to supply all our wants, to raise us above servile dependence, and provide us with such conveniences as are suited to our rank and condition in life. To be regardles of this measure of wealth is to expose ourselves to all the temptations of poverty and corruption; to forfeit our natural independence and freedom; to degrade, and consequently to render the rank we hold, and the character we sustain in society, useless, if not contemptible. When these important ends are secured, we ought not to murmur or repine that we possess no more; yet we are not secluded by any obligation, moral or divine, from seeking more, in order to give us that happiness and most God-like of all powers, the power of doing good. A supine indolence in this respect is both absurd and criminal; absurd, as it robs us of an inexhausted fund of the most refined and durable enjoyments; and criminal, as it renders us so far useless to the society to which we belong. "That pursuit of wealth which goes beyond the former end, viz. the obtaining the necessaries, or such conveniences of life, as in the estimation of reason, not of vanity or passion, are suited to our rank and condition, and yet is not directed to the latter, viz. the doing good, is what we call avarice." And "that pursuit of power, which, after securing one's self, i.e. attaining the proper independence and liberty of a rational social creature, is not directed to the good of others, is what we call ambition, or the lust of power." To what extent the first measures of virtue will allow us to pursue either wealth, or power, and civil authority, is not perhaps possible precisely to determine. That must be left to prudence, and the peculiar character, condition, and other circumstances of each man. Only thus far a limit may be set, that the pursuit of either must encroach upon no other duty or obligation which we owe to ourselves, to society, or to its Parent and Head. The same reasoning is to be applied to power as to wealth. It is only valuable as an instrument of our own security, and of the free enjoyment of those original goods it may, and often does, administer to us; and as an engine of more extensive happiness to our friends, our country, and mankind.

Now the best, and indeed the only way to obtain a solid and lasting fame, is an uniform inflexible course of virtue, the employing one's ability and wealth in supplying the wants, and using one's power in promoting or securing the happiness, the rights and liberties of mankind, joined to an universal affability and politeness of manners. And surely one will not mistake the matter much, who thinks the same course conducive to the acquiring greater accessions both of wealth and power: especially if he adds to those qualifications a vigorous industry, a constant attention to the characters and wants of men, to the conjunctions of times, and continually varying geniuses of affairs; and a sedate intrepid honesty, that will not yield to the allurements, nor be overawed with the terrors of that corrupt and corrupting scene in which we live. We have sometimes heard, indeed, of other ways and means, as fraud, dissimulation, sordidity, and prostitution, and the like ignoble arts, by which the men of the world (as they are called, through politicians, and men of address!) amass wealth, and procure power; but as we want rather to form a man of virtue, an honest, contented, happy man, we leave to the men of the world their own ways, and permit them unencumbered, and unmimimetically, to reap the fruit of their doings.

The next species of objects in the scale of good, are the goods of the intellect; as knowledge, memory, judgement, taste, sagacity, docility, and whatever else we call intellectual virtues. Let us consider them a little, and the means as well as obligations to improve them.

As man is a rational creature, capable of knowing the differences of things and actions;—as he not only sees and feels what is present, but remembers what is past, and often foresees what is future;—as he advances, from small beginnings
beginnings, by slow degrees, and with much labour and difficulty, to knowledge and experience;—as his opinions sway his passions;—as his passions influence his conduct,—and as his conduct draws consequences after it, which extend not only to the present, but to the future time, and therefore is the principal source of his happiness or misery;—it is evident, that he is formed for intellectual improvements, and that it must be of the utmost consequence for him to improve and cultivate his intellectual powers, on which those opinions, those passions, and that conduct depend.

But besides the future consequences and moment of improving our intellectual powers, their immediate exercise on their proper objects yields the most rational and refined pleasures. Knowledge and a right taste in the arts of imitation and design, as poetry, painting, sculpture, music, architecture, afford not only an innocent, but a most sensible and sublime entertainment. By these the understanding is instructed in ancient and modern life, the history of men and things, the energies and effects of the passions, the consequences of virtue and vice; by these the imagination is at once entertained and nourished with the beauties of nature and art, lighted up and spread out with the novelty, grandeur, and harmony of the universe; and in fine, the passions are agreeably roused, and suitably engaged by the greatest and most interesting objects that can fill the human mind. He who has a taste formed to these ingenious delights, and plenty of materials to gratify it, can never want the most agreeable exercise and entertainment, nor once have reason to make that fashionable complaint of the tediousness of time. Nor can he want a proper subject for the discipline and improvement of his heart. For being daily conversant with beauty, order and design, in inferior subjects, he bids fair for growing in due time an admirer of what is fair and well-proportioned in the conduct of life, and the order of society, which is only order and design exerted in their highest subject. He will learn to transfer the numbers of poetry to the harmony of the mind, and of well-governed passions; and from admiring the virtues of others in moral paintings, come to approve and imitate them himself. Therefore to cultivate a true and correct taste, must be both our interest and our duty, when the circumstances of our situation give leisure and opportunity for it, and when the doing it is not inconsistent with our higher obligations or engagements to society and mankind.

It is best attained by reading the best books, where good sense has more the ascendant than learning, and which retain more to practice than to speculation; by studying the best models, i.e. those which profess to imitate nature most, and approach the nearest to it; and by converting with men of the most refined taste, and the greatest experience in life.

As to the other intellectual goods, what a fund of entertainment must it be to investigate the truth and various relations of things; to trace the operations of nature to general laws; to explain by these its manifold phenomena; to understand that order by which the universe is upheld, and that economy by which it is governed; to be acquainted with the human mind, the connection, subordinations, and uses of its powers, and to mark their energy in life! How agreeable to the ingenious inquirer, to observe the manifold relations and combinations of individual minds in society; to discern the causes why they flourish or decay; and from thence to ascend, through the vast fable of beings, to that General Mind which presides over all, and operates unseen in every fylem, and in every age, through the whole compass and progression of nature! Devoted to such entertainments as these, the contemplative have abandoned every other pleasure, and sequestrated themselves from social intercourse; for these the busy have often preferred, to the hurry and din of life, the calm retreats of contemplation; for these, when once they came to taste them, even the gay and voluptuous have thrown up the lawless pursuits of flene and appetite, and acknowledged these mental enjoyments to be the most refined, and indeed the only luxury. Besides, by a just and large knowledge of nature, we recognize the perfections of its Author; and thus piety, and all those pious affections which depend on just sentiments of his character, are awakened and confirmed; and a thousand superstitious fears, that arise from partial views of his nature and works, will of course be excluded. An extensive prospect of human life, and of the periods and revolutions of human things, will conduct much to the giving a certain greatness of mind, and a noble contempt of those little competitions about power, honour, and wealth, which disturb and divide the bulk of mankind; and promote a calm indulgence of those inconveniences and ills that are the common appendages of humanity. Add to all, that a just knowledge of human nature, and of those hinges upon which the business and fortunes of men turn, will prevent our thinking either too highly, or too meanly of our fellow-creatures; give no small scope to the exercise of friendship, confidence, and goodwill; and, at the same time, brace the mind with a proper caution and distrust, and give a greater mastery in the conduct of private as well as public life. Therefore, by cultivating our intellectual abilities, we shall be assisted to secure our interest, and be qualified for acting our part in society with more honour to ourselves, as well as advantage to mankind. Consequentially, to improve them to the utmost of our power is our duty; they are talents committed to us by the Almighty Head of society, and we are accountable to him for the use of them.

The intellectual virtues are best improved by accurate and impartial observation, extensive reading, and unconfined converse with men of all characters, especially with those who, to private study, have joined the widest acquaintance with the world and greatest practice in its affairs; but above all, by being much in the world, and having large dealings with mankind. Such opportunities contribute much to divest one of prejudices and a servile attachment to crude systems, to open one's views, and to give that experience on which the most useful knowledge is built, and from which the surest maxims for the conduct of life are deduced.

The highest goods which enter into the composition of human happiness are moral goods of the mind, directly and ultimately regarding ourselves; as command of the appetites and passions, prudence and caution, magnanimity, fortitude,
Morality is another virtue of high rank and dignity, though often mistaken by proud mortals for meanness and puillanimit. It is opposed to pride, which commonly includes in it a false or over-rated estimation of our own merit, an aperception of it to ourselves as its only and original cause, an undue comparison of ourselves with others, and, in consequence of that suppos'd superiority, an arrogant preference of ourselves, and a supercilious contempt of them. Humility, on the other hand, seems to denote that modest and ingenuous temper of mind, which arises from a just and equal estimate of our own advantages compared with those of others, and from a sense of our deriving all originally from the Author of our being. Its ordinary attendants are meekness, a gentle forbearance, and an easy unassuming humanity with regard to the imperfections and faults of others; virtues rare indeed, but of the fairest completion, the proper offspring of so lovely a parent, the best ornaments of such imperfect creatures as we are, precious in the sight of God, and which sweetly allure the hearts of men.

Resignation is that mild and heroic temper of mind, which arises from a sense of an infinitely wise and good providence, and enables one to acquiesce with a Cordial affection in its just appointments. This virtue has something very peculiar in its nature, and sublime in its efficacy. For it teaches us to bear ills, not only with patience, and as being unavoidable; but it transforms, as it were, ill into good, by leading us to consider it, and every thing that has the least appearance of ills, as a divine dispensation, a wise and benevolent temper of things, subservient to universal good, and of course including that of every individual, especially of such as calmly flock to it. In this light, the administration itself, nay, every act of it, becomes an object of affection; the evil disappears, or is converted into a balm which both heals and nourishes the mind. For, though the first unexpected access of ills may surprize the soul into grief; yet that grief, when the mind calmly reviews its object, changes into contentment, and is by degrees exalted into generation and a divine composure. Our private will is lost in that of the Almighty, and our security against every real ill rests on the same bottom as the throne of Him who lives and reigns for ever.
Before we finish this section, it may be fit to observe, that as the Deity is the supreme and inexhausted source of good, on whom the happiness of the whole creation depends; as he is the highest object in nature, and the only object who is fully proportioned to the intellectual and moral powers of the mind, in whom they ultimately rest and find their most perfect exercise and completion; he is therefore termed the chief good of man objectively considered: And virtue, or the proportioned and vigorous exercise of the several powers and affections on their respective objects, as above described, is, in the schools, termed the chief good formally considered, or its formal idea, being the inward temper and native constitution of human happiness.

From the detail we have gone through, the following corollaries may be deduced.

1. It is evident that the happiness of such a progressive creature as man can never be at a stand, or continue a fixed invariable thing. His finite nature, let it rise ever so high, admits still higher degrees of perfection and perfection: and his progress in improvement, or virtue, always makes way for a progression in happiness. So that no possible point can be assigned in any period of his existence in which he is perfectly happy; that is, so happy as to exclude higher degrees of happiness. All his perfection is only comparative. 2. It appears that many things must concur to complete the happiness of so various a creature as man, subject to so many wants, and susceptible of such different pleasures. 3. As his capacities of pleasure cannot be all gratified at the same time, and must often interfere with each other in such a precarious and fleeting state as human life, or be frequently disappointed, perfect happiness, i.e. the undisturbed enjoyment of the several pleasures of which we are capable, is unattainable in our present state. 4. That state is most to be sought after, in which the fewest competitions and disappointments can happen, which least of all impairs any sense of pleasure, and opens an inexhausted source of the most refined and lasting enjoyments. 5. That state which is attended with all those advantages is a state or course of virtue. 6. Therefore, a state of virtue, in which the moral goods of the mind are attained, is the happiest state.

DUTIES TO SOCIETY.

Filial and Fraternal duty.

As we have followed the order of nature in tracing the history of man, and those duties which he owes to himself; it seems reasonable to take the same method with those he owes to society, which constitute the second class of his obligations.

His parents are among the earliest objects of his attention; he becomes sooner acquainted with them, reposes a peculiar confidence in them, and seems to regard them with a fond affection, the early prognostics of his future piety and gratitude. Thus does nature dictate the first lines of filial duty, even before a just sense of the connection is formed. But when the child is grown up, and has attained to such a degree of understanding as to comprehend the moral tie, and be sensible of the obligations he is under to his parents; when he looks back on their tender and disinterested affection, their incessant cares and labours in nursing, educating and providing for him during that state in which he had neither prudence nor strength to care and provide for himself; he must be conscious that he owes to them these peculiar duties.

1. To reverence and honour them as the instruments of nature in introducing him to life, and to that state of comfort and happiness which he enjoys; and therefore to esteem and imitate their good qualities, to alleviate and bear with, and spread as much as possible a decent veil over their faults and weaknesses.

2. To be highly grateful to them for those favours which it can hardly ever be in his power fully to repay; to shew this gratitude by a strict attention to their wants, and a solicitous care to supply them; by a submissive deference to their authority and advice; by yielding to, rather than peremptorily contending with their humours, as remembering how oft they have been persecuted by his; and in fine, by soothing their cares, lightening their sorrows, supporting the infirmities of age, and making the remainder of their life as comfortable and joyful as possible.

As his brethren and sisters are the next with whom the creature forms a social and moral connection, to them he owes a fraternal regard; and with them ought he to enter into a strict league of friendship, mutual sympathy, advice, assistance, and a generous intercourse of kind offices, remembering their relation to common parents, and that brotherhood of nature which unites them into a closer community of interest and affection.

Concerning Marriage.

When man arrives to a certain age, he becomes sensible of a peculiar sympathy and tenderness towards the other sex; the charms of beauty engage his attention, and call forth new and softer dispositions than he has yet felt. The many amiable qualities exhibited by a fair outside, or by the mild allurement of female manners, or which the prejudiced spectator without much reasoning supposes those to include, with several other circumstances, point his view and affection to a particular object, and of course conduct that general rambling regard, which was lost and useless among the undistinguished crowd, into a peculiar and permanent attachment to one woman, which ordinarily terminates in the most important, venerable, and delightful connection in life.

The state of the brute-creation is very different from that of human creatures. The former are clothed and generally armed by their structure, easily find what is necessary to their subsistence, and soon attain their vigour and maturity; so that they need the care and aid of their parents but for a short while; and therefore we see that nature has assigned to them vagrant and transient amours. The connection being purely natural, and formed merely for propagating and rearing their offspring; no sooner is that end answered, than the connection dissolves of course. But the human race are of a more tender and defenceless constitution; their infancy and non-age continue longer; they advance slowly to strength of body, and maturity of reason; they need constant attention, and a long series of cares.
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cares and labours to train them up to decency, virtue, and the various arts of life. Nature has, therefore, provided them with the most affectionate and anxious tutors, to aid their weakens, to supply their wants, and to accomplish them in those necessary arts; even their own parents, on whom she has devolved this mighty charge, rendered agreeable by the most alluring and powerful of all ties, parental affection. But unless both concur in this grateful task, and continue their joint labours, till they have reared up and planted out their young colony, it must become a prey to every rude invader, and the purpose of nature in the original union of the human pair be defeated. Therefore our structure as well as condition is an evident indication, that the human sexes are defined for a more intimate, for a moral and lasting union. It appears likewise, that the principal end of marriage is not to propagate and nurse up an offspring, but to educate and form minds for the great duties and extensive definitions of life. Society must be supplied from this original nursery with useful members, and its fairest ornaments and supports.

The mind is apt to be diffipated in its views, and acts of friendship and humanity; unless the former be directed to a particular object, and the latter employed in a particular province. When men once indulge to this diffipation, there is no stopping their career; they grow insensible to moral attractions, and, by obstructing or impairing the decent and regular exercise of the tender and generous feelings of the human heart, they in time become unqualified for, or adverse to, the forming a moral union of souls, which is the cement of society, and the source of the purest domestic joys. Whereas a rational undepraved love, and its fair companion marriage, collect a man's views, guide his heart to its proper object, and by confining his affection to that object do really enlarge its influence and use. Besides, it is but too evident from the conduct of mankind, that the common ties of humanity are too feeble to engage and interest the passions of the generality in the affairs of society. The connections of neighbourhood, acquaintance, and general intercourse, are too wide a field of action for many; and those of a public or community are so for more, and in which they either care not or know not how to exert themselves. Therefore nature, ever wise and benevolent, by implanting that strong sympathy which reigns between the individuals of each sex, and by urging them to form a particular moral connexion, the spring of many domestic endearments, has measured out to each pair a particular sphere of action, proportioned to their views, and adapted to their respective capacities. Besides, by intereting them deeply in the concerns of their own little circle, she has connected them more closely with society, which is composed of particular families, and bound them down to their good behaviour in that particular community to which they belong. This moral connexion is marriage, and this sphere of action is a family.

Of the conjugal alliance the following are the natural conqueuence of the matrimonial connexion, and the duties which they owe them result as naturally from that connexion. The feeble state of children, subject to so many wants and dangers, requires their incessant care and attention; their ignorant and uncultivated minds demand their continual instruction and culture. Had human creatures come into the world with the full strength of men, and the weaknesses of reason and vehemence of passions which prevail in children, they would have been too strong or too flabby to have submitted to the government and instruction of their parents. But, as they were designed for a progeileion in knowledge and virtue, it was proper that the growth of their bodies should keep pace with that of their minds, left the purposes of that progression should have been defeated. Among other admirable purposes which this gradual expansion of their outward as well as inward structure serves, this is one, that it affords ample scope to the exercise of many tender and generous affections, which fill up the domestic life with a beautiful variety of duties and enjoyments; and are of course a noble discipline for the heart, and an hardy kind of education for the more honourable and important duties of public life.

The above-mentioned weak and ignorant state of children, seems plainly to invest their parents with such authority.
authority and power as is necessary to their support, protection, and education; but that authority and power can be continued to extend no farther than is necessary to answer those ends, and to last no longer than that weakness and ignorance continue; wherefore, the foundation or reason of the authority and power ceasing, they cease of course. Whatever power or authority, then, it may be necessary or lawful for parents to exercise during the non-age of their children, to allure or usurp the fame when they have attained the maturity or full exercise of their strength and reason, would be tyrannical and unjust. From hence it is evident, that parents have no right to punish the persons of their children more severely than the nature of their wardship requires; much less to invade their lives, to encroach upon their liberty, or transfer them as their property to any matter whatsoever.

The first clas of duties which parents owe their children respect their natural life; and these comprehend protection, nurture, provision, introducing them into the world in a manner suitable to their rank and fortune, and the like.

The second order of duties regards the intellectual and moral life of their children, or their education in such arts and accomplishments as are necessary to qualify them for performing the duties they owe to themselves and to others. As this was found to be the principal design of the matrimonial alliance, so the fulfilling that design is the most important and dignified of all the parental duties. In order therefore to fit the child for acting his part wisely and worthly, as a man, as a citizen, and a creature of God, both parents ought to combine their joint wisdom, authority, and power, and each apart to employ those talents which are the peculiar excellency and ornament of their respective sex. The father ought to lay out and superintend their education; the mother to execute and manage the detail of which she is capable. The former should direct the manly exertion of the intellectual and moral powers of his child. His imagination, and the manner of those exertions, are the peculiar province of the latter. The former should advise, protect, command, and, by his experience, masculine vigour, and that superior authority which is commonly ascribed to his sex, brace and strengthen his pupil for active life, for gravity, integrity, and firmness in suffering. The feminine of the latter is to bend and soften her male pupil, by the charms of her conversation, and the softness and decency of her manners, for social life, for politeness of taste, and the elegant decorums of and enjoyments of humanity; and to improve and refine the tenderness and modesty of her female pupil, and form her to all those mild domestic virtues, which are the peculiar characteristics and ornaments of her sex.

To conduct the opening minds of their sweet charge through the several periods of their progress; to assist them in each period in throwing out the latent seeds of reason and ingenuity, and in gaining fresh accretions of light and virtue; and at length, with all these advantages, to produce the young adventurers upon the great theatre of human life, to play their several parts in the fight of their friends, of society, and mankind.

Herite and Servile Duty.

In the natural course of human affairs it must necessarily happen, that some of mankind will live in plenty and opulence, and others be reduced to a state of indigence and poverty. The former need the labours of the latter, and the latter the provision and support of the former. This mutual necessity is the foundation of that connection, whether we call it moral or civil, which subordinates masters and servants. He who feeds another has a right to some equivalent, the labour of him whom he maintains, and the fruits of it. And he who labours for another has a right to expect that he should support him. But as the labours of a man of ordinary strength are certainly of greater value than mere food and clothing; because they would actually produce more, even the maintenance of a family, were the labourer to employ them in his own behalf; therefore he has an undoubted right to rate and dispose of his service for certain wages above mere maintenance; and if he has incantually disposed of it for the latter only, yet the contract being of the onerous kind, he may equitably claim a supply of that deficiency. If the service be specified, the servant is bound to that only; if not, then he is to be construed as bound only to such services as are consistent with the laws of justice and humanity. By the voluntary servitude to which he subjects himself, he forfeits no rights but such as are necessarily included in that servitude, and is obnoxious to no punishment but such as a voluntary failure in the service may be supposed reasonably to require. The offspring of such servants have a right to that liberty which neither they nor their parents have forfeited.

As to those who, because of some heinous offence, or for some notorious damage, for which they cannot otherwise compensate, are condemned to perpetual service; they do not, on that account, forfeit all the rights of men; but those, the loss of which is necessary to secure society against the like offences for the future, or to repair the damage they have done.

With regard to captives taken in war, it is barbarous and inhuman to make perpetual slaves of them, unless some peculiar and aggravated circumstances of guilt have attended their hostility. The bulk of the subjects of any government engaged in war, may be fairly esteemed innocent enemies; and therefore they have a right to that clemency which is consistent with the common safety of mankind, and the particular security of that society against which they are engaged. Though ordinary captives have a right to their lives; yet to pay their liberty as an equivalent, is much too high a price. There are other ways of acknowledging or returning the favour, than by surrendering what is far dearer than life itself. To those who, under pretext of the necessities of commerce, drive the unnatural trade of bargaining for human flesh, and configning their innocent but unfortunate fellow-creatures to eternal servitude and misery, we may address the words of a fine writer: "Let avance defend it as it will, there is an honest reluctance in humanity against buying and selling and regarding those of our own species as our wealth and possessions."
Social Duties of the private Kind.

Hitherto we have considered only the domestic economical duties, because these are first in the progress of nature. But as man passes beyond the little circle of a family, he forms connections with relations, friends, neighbours, and others; from whence results a new train of duties of the more private social kind, as friendship, chastity, courtesy, good-neighbourhood, charity, forgiveness, hospitality.

Man is admirably formed for particular social attachments and duties. There is a peculiar and strong propensity in his nature to be affected with the sentiments and dispositions of others. Men, like certain musical instruments, are set to each other, so that the vibrations or notes excited in one raise correspondent notes and vibrations in the others. The impulses of pleasure or pain, joy or sorrow, made on one mind, are, by an instantaneous sympathy of nature, communicated in some degree to all; especially when hearts are in unison of kindness; the joy that vibrates in one, communicates to the other also. We may add, that though joy thus imparted swells the harmony; yet grief vibrated to the heart of a friend, and rebounding from thence in sympathetic notes, melts, as it were, and almost dies away. All the passions, but especially those of the social kind, are contagious; and when the passions of one man mingle with those of another, they increase and multiply prodigiously. There is a most moving eloquence in the human countenance, air, voice, and gesture, wonderfully expressive of the most latent feelings and passions of the soul, which darts them, like a subtle flame, into the hearts of others, and raises correspondent feelings there: friendship, love, good-humour, joy, spread through every feature, and particularly shoot from the eyes their softer and fiercer fires with an irresistible energy. And in like manner, the opposite passions of hatred, enmity, ill humour, melancholy, diffuse a sultry and fadening air over the face, and, glancing from eye to eye, kindle a train of similar passions. By these and other admirable pieces of machinery, men are formed for society and the delightful interchange of friendly sentiment and duties; to increase the happiness of others by participation, and their own by rebound; and to diminish, by dividing, the common flock of their misery.

The first emanations of the social principle beyond the bounds of a family, lead us to form a nearer conjunction of friendship or goodwill with those who are anywise connected with us by blood or domestic alliance. To them our affection does, commonly, exert itself in a greater or less degree, according to the nearness or distance of the relation. And this proportion is admirably fitted to the extent of our powers and the indifference of our state; for it is only within those closer circles of consanguinity or alliance, that the generality of mankind are adapted to display their abilities or benevolence, and consequently to uphold their connection with society and subserviency to a public interest. Therefore it is our duty to regard these closer connections as the next department to that of a family, in which nature has marked out for us a sphere of activity and usefulness; and to cultivate the kind affections which are the cement of those endearing alliances.

Frequently, the view of distinguishing moral qualities in some of our acquaintance may give birth to that more noble connection we call friendship, which is far superior to the alliances of consanguinity. For these are, of a superficial, and often of a transitory nature; of which, as they hold more of infinint than of reason, we cannot give such a rational account. But friendship derives all its strength and beauty, and the only existence which is durable, from the qualities of the heart, or from virtuous and lovely dispositions. Therefore friendship may be described to be, "The union of two souls, by means of virtue, the common object and cement of their mutual affection." Without virtue, or the supposition of it, friendship is only a mercenary league, an alliance of interest, which must dissolve of course when that interest decays or subsides no longer. It is not so much any particular passion, as a composition of some of the noblest feelings and passions of the mind. Good sense, a just taste and love of virtue, a thorough candor and benignity of heart, or what we usually call a good temper, and a generous sympathy of sentiments and affections, are the necessary ingredients of this virtuous connection. When it is grafted on esteem, strengthened by habit, and mulled over by time, it yields infinite pleasure ever new and ever growing, is a noble support amidst the various trials and vicissitudes of life, and an high seasoning to most of our other enjoyments. To form and cultivate virtuous friendship must be very improving to the temper; as its principal object is virtue, set off with all the allurement of countenance, air, and manners, shining forth in the native graces of many honest sentiments and affections, and rendered visible as it were to the friendly spectator in a conduct unaffectedly great and good; and as its principal exercices are the very energies of virtue, or its effects and emanations. So that, wherever this amiable attachment prevails, it will exalt our admiration and attachment to virtue, and, unless impeded in its course by unnatural prejudices, run out into a friendship to the human race. For as no one can merit, and none ought to usurp, the sacred name of friend, who hates mankind; so, whoever truly loves them, possesses the most effential quality of a true friend.

The duties of friendship are, a mutual esteem of each other, unbribed by interest, and independent of it; a generous confidence, as far distanted from suspicion as from reserve; an inviolable harmony of sentiments and dispositions, of designs and interests; a fidelity unshaken by the changes of fortune; a constancy unalterable by distance of time or place; a renunciation of one's personal interests to those of one's friend; and a reciprocal, unenvious, unreserved exchange of kind offices. But amidst all the exertions of this moral connection, humane and generous as it is, we must remember that it operates within a narrow sphere, and its immediate operations respect only the individual; and therefore particular impulses must still be subordinated to a more public interest, or be always directed and controlled by the more extensive connections of our nature.

When our friendship terminates on any of the other

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sex, in whom beauty or agreeableness of person and external gracefulness of manners conspire to express and heighten the moral charm of a tender honest heart, and sweet, ingenious, modest temper, lighted up by good sense, it generally grows into a more soft and endearing attachment. When this attachment is improved by a growing acquaintance with the worth of its object, is conducted by discretion, and issues at length, as it ought to do, in the moral connection of marriage, it becomes the source of many amiable duties, of a communication of passions and interests, of the most refined decencies, and of a thousand nameless deep-seated joys of reciprocal tenderness and love, flowing from every look, word, and action. Here friendship acts with double energy, and the natural conspires with the moral charm to strengthen and secure the love of virtue. As the delicate nature of female honour and decorum, and the inexpressible grace of a chaste and modest behaviour, are the fairest and indeed the only means of kindling at first, and ever after of keeping alive this tender and elegant flame, and of accomplishing the excellent ends designed by it; to attempt by fraud to violate one, or, under pretence of passion, fully and corrupt the other, and, by so doing, to expose the too often credulous and unguarded object, with a wanton cruelty, to the hatred of her own sex, and the scorn of ours, and to the lowest infamy of both, is a conduct not only base and criminal, but inconsistent with that truly rational and refined enjoyment, the spirit and quintessence of which is derived from the bafilful and sacred charms of virtue kept untainted, and therefore ever alluring to the lover's heart.

Courtesy, good-neighbourhood, affability, and the like duties which are founded on our private social connections, are no less necessary and obligatory to creatures united in society, and supporting and supported by each other in a chain of mutual want and dependence. They do not conflict in a smooth address, an artificial or obsequious air, fawning adulation, or a polite servility of manners; but in a just and modest sense of our own dignity and that of others, and of the reverence due to mankind, especially to those who hold the higher links of the social chain; in a different and manly accommodation of ourselves to the fables and humours of others; in a strict observance of the rules of decorum and civility; but above all in a frank obliging carriage, and generous interchange of good deeds rather than words. Such a conduct is of great use and advantage, as it is an excellent security against injury, and the best claim and recommendation to the esteem, civility, and universal respect of mankind. This inferior order of virtues unites the particular members of society more closely, and form the less pillars of the civil fabric; which, in many instances, supply the unavoidable defects of laws, and maintain the harmony and decorum of social intercourse, where the more important and essential lines of virtue are wanting.

Charity and forgiveness are truly amiable and useful duties of the social kind. There is a twofold distinction of rights commonly taken notice of by moral writers, viz. perfect and imperfect. To fulfill the former, is necessary to the being and support of society; to fulfill the latter, is a duty equally sacred and obligatory, and tends to the improvement and prosperity of society: but as the violation of them is not equally prejudicial to the public good, the fulfilling them is not subjected to the cognizance of laws, but left to the candor, humanity, and gratitude of individuals. And by this means ample scope is given to exercise all the generosity, and display the genuine merit and luftre of virtue. Thus the wants and misfortunes of others call for our charitable assistance and feaonable supplies: and the good man, unconstrained by law, and uncontrolled by human authority, will cheerfully acknowledge and generously satisfy this mournful and moving claim; a claim supported by the sanction of heaven, of whose bounties he is honoured to be the grateful trustee. If his own perfect rights are invaded by the injustice of others, he will not therefore reject their imperfect right to pity and forgiveness, unless his grant of these should be inconsistent with the more extensive rights of society or the public good. In that case he will have recourse to public justice and the laws; and even then he will prosecute the injury with no unnecessary severity, but rather with mildness and humanity. When the injury is merely personal, and of such a nature as to admit of alleviations, and the forgiveness of which would be attended with no worse confequences, especially of a public kind, the good man will generously forgive his offending brother. And it is his duty to do so, and not to take private revenge, or retaliate evil for evil. For though resentment of injury is a natural passion, and implanted, as was observed above, for wise and good ends; yet, considering the manifold partialities which most men have for themselves, was every one to act as judge in his own cause, and to execute the sentence dictated by his own resentment, it is but too evident that mankind would pass all bounds in their fury, and the last sufferer be provoked in his turn to make full reprisals. So that evil, thus encountering with evil, would produce one continued series of violence and misery, and render society intolerable, if not impracticable. Therefore, where the security of the individual, or good of the public, does not require a proportionable retaliation, it is agreeable to the general law of benevolence, and to the particular end of the passion (which is to prevent injury, and the misery occasioned by it) to forgive personal injuries, or not to return evil for evil. This duty is one of the noble refinements which Christianity has made upon the general maxims and practice of mankind, and enforced with a peculiar strength and beauty by sentiments no less alluring than awful. And indeed the practice of it is generally its own reward; by expelling from the mind the most dreadful intruders upon its repose, those rancorous passions which are begot and nursed by resentment; and by disarming and even subduing every enemy one has, except such as have nothing left of men but the outward form.

The most enlarged and humane connection of the private kind, seems to be the hospitable alliance from which flow the amiable and disinterested duties we owe to strangers. If the exercise of passions of the most private and instinctive kind is held with moral approbation and delight, how lovely and venerable must those appear, which result from a calm philanthropy, are founded in the common rights and connections of society, and embrace men, not...
not of a particular sect, party, or nation, but all in general without distinction, and without any of the little partialities of self-love!

Social Duties of the Commercial Kind.

The next order of connections are those which arise from the wants and weaknesses of mankind, and from the various circumstances in which their different situations place them. These we may call commercial connections; and the duties which result from them commercial duties, as justice, fair-dealing, sincerity, fidelity to compacts, and the like.

Though nature is perfect in all her works, yet she has observed a manifest and eminent distinction among them. To all such as lie beyond the reach of human skill and power, and are properly of her own department, she has given the finishing hand. These may design after and imitate; but he can neither rival them, nor add to their beauty or perfection; such are the forms and structures of vegetables, animals, and many of their productions. There are others of her works which she has of design left unfinished, as it were, in order to exercise the ingenuity and power of man. She has presented to him a rich profusion of materials of every kind for his convenience and use; but they are rude and unpolished, or not to be come at without art and labour. These therefore he must apply, in order to adapt them to his use, and to enjoy them in perfection. Thus nature has given him an infinite variety of herbs, grain, fossils, minerals, wood, water, earth, and a thousand other crude materials to supply his numerous wants. But he must saw, plant, dig, refine, polish, build, and, in short, manufacture the various produce of nature, in order to obtain even the necessaries, and much more the conveniences and elegancies of life. These, then, are the price of his labour and industry; and, without that, nature will fell him nothing. But as the wants of mankind are many, and the single strength of individuals small, they could hardly find the necessaries, and much less the conveniences of life, without uniting their ingenuity and strength in acquiring these, and without a mutual intercourse of good offices. Some men are better formed for some kinds of ingenuity and labour, and others for other kinds; and different soils and climates are enriched with different productions; so that men, by exchanging the produce of their respective labours, and supplying the wants of one country with the superfluities of another, do, in effect, diminish the labours of each, and increase the abundance of all. This is the foundation of all commerce, or exchange of commodities and goods one with another; in order to facilitate which, men have contrived different species of coin or money, as a common standard by which to estimate the comparative values of their respective goods. But, to render commerce secure and effectual, justice, fair-dealing, sincerity, and fidelity to compacts are absolutely necessary.

Justice, or fair dealing, or, in other words, a disposition to treat others as we would be treated by them, is a virtue of the first importance, and inseparable from the virtuous character. It is the cement of society, or that pervading spirit which connects its members, inspires its various relations, and maintains the order and subordination of each part to the whole. Without it, society would become a den of thieves and banditti, hating and hated, devouring and devoured, by one another.

Sincerity or veracity in our words and actions is another virtue or duty of great importance to society, being one of the great bands of mutual intercourse, and the foundation of mutual trust. Without it, society would be the dominion of mistrust, jealousy and fraud, and conversation a traffic of lies and dissimulation. It includes in it a conformity of our words with our sentiments, a correspondence between our actions and dispositions, a strict regard to truth, and an irreconcilable abhorrence of falsehood. It does not indeed require that we expose our sentiments indifferently, or tell all the truth in every case; but certainly it does not and cannot admit the least violation of truth, or contradiction to our sentiments. For if these bounds are once passed, no possible limit can be assigned where the violation shall stop; and no pretence of private or public good can possibly counterbalance the ill consequences of such a violation.

Fidelity to promises, compacts and engagements, is likewise a duty of such importance to the security of commerce and interchange of benevolence among mankind, that society would soon grow intolerable without the strict observance of it. Hobbes, and others who follow the same track, have taken a wonderful deal of pains to puzzle this subject, and to make all the virtues of this fort merely artificial, and not at all obligatory, antecedent to human conventions. No doubt, compacts suppose people who make them, and promises suppose persons to whom they are made; and therefore both suppose some society more or less between those who enter into these mutual engagements. But is not a compact or promise binding, till men have agreed that they shall be binding? Or are they only binding because it is our interest to be bound by them, or to fulfill them? Do not we highly approve the man who fulfills them, even though they should prove to be against his interest? And do not we condemn him as a knave, who violates them on that account? A promise is a voluntary declaration, by words, or by an action equally significant, of our resolution to do something in behalf of another, or for his service. When a promise is made, the person who makes it is by all supposed under an obligation to perform it; and he to whom it is made may demand the performance as his right. That perception of obligation is a simple idea, and is on the same footing as our other moral perceptions; which may be described by instances, but cannot be defined. Whether we have a perception of such obligation quite distinct from the interest, either public or private, that may accompany the fulfillment of it, must be referred to the conscience of every individual. And, whether the mere sense of that obligation, apart from its concomitants, is not a sufficient inducement or motive to keep one's promise, without having recourse to any selfish principle of our nature, must be likewise appealed to the conscience of every honest man. Fair dealing and fidelity to compacts require that we take no advantage of the ignorance, passion, or incapacity of others, from whatever cause that incapacity arises;—that we be explicit and candid in making bargains, just and faithful
faithful in fulfilling our part of them. And if the other party violates his engagements, redress is to be sought from the laws, or from those who are intrusted with the execution of them. In fine, the commercial virtues and duties require that we not only do not invade, but maintain the rights of others; —that we be fair and impartial in transferring, bartering, or exchanging property, whether in goods or service; —and be inviolably faithful to our word and our engagements, where the matter of them is not criminal, and where they are not extorted by force.

Social Duties of the Political Kind.

We are now arrived at the last and highest order of duties respecting society, which result from the exercise of the most generous and heroic affections, and are founded on our most elegant connections.

The social principle in man is of such an expansive nature, that it cannot be confined within the circuit of a family, of friends, or a neighbourhood; it spreads into wider systems, and draws men into larger confederacies, communities, and commonwealths. —It is in these only that the higher powers of our nature attain the highest improvement and perfection of which they are capable. These principles hardly find objects in the solitary state of nature. There the principle of action rises no higher at first than natural affections towards one's offspring. There personal or family-wants entirely engross the creature's attention and labour, and allow no leisure, or, if they did, no exercise for views and affections of a more enlarged kind. In solitude all are employed in the same way, in providing for the animal life. And even after their utmost labour and care, single and unaided by the industry of others, they find but a sorry supply of their wants, and a feeble precarious security against dangers from wild beasts, from inclement skies and seasons, from the mistakes or petulant passions of their fellow-creatures, from their preference of themselves to their neighbours, and from all the little exorbitances of self-love. But in society, the mutual aids which men give and receive shorten the labours of each, and the combined strength and reason of individuals give security and protection to the whole body. There is both a variety and subordination of genius among mankind. Some are formed to lead and direct others; to contrive plans of happiness for individuals, and of government for communities; to take in a public interest; to invent laws and arts, and superintend their execution; and, in short, to refine and civilize human life. Others, who have not such good heads, may have as honest hearts, a truly public spirit, love of liberty, hatred of corruption and tyranny, a generous submission to laws, order, and public institutions, and an extensive philanthropy. And others, who have none of those capacities either of heart, or head, may be well formed for manual exercises and bodily labour. The former of these principles have no scope in solitude, where a man's thoughts and concerns do all either center in himself, or extend no farther than a family; into which little circle all the duty and virtue of the solitary mortal is crowded. But society finds proper objects and exercises for every genius, and the noblest objects and exercises for the noblest geniuses, and for the highest principles in the human constitution: particularly for that warmest and most divine passion, which God hath kindled in our bosoms, the inclination of doing good, and reverencing our nature; which may find here both employment, and the most exquisite satisfaction. In society a man has not only more leisure, but better opportunities of applying his talents with much greater perfection and success, especially as he is furnished with the joint advice and assistance of his fellow-creatures, who are now more closely united one with the other, and sustain a common relation to the same moral system, or community.

This then is an object proportioned to his most enlarged social affections, and in serving it he finds scope for the exercise and refinement of his highest intellectual and moral powers. Therefore society, or a state of civil government, rests on these two principal pillars; “that in it we find security against those evils which are unavoidable in solitude; and obtain those goods, some of which cannot be obtained at all, and others not so well, in that state, where men depend solely on their individual sagacity and industry.”

From this short detail it appears that man is a social creature, and formed for a social state; and that society, being adapted to the higher principles and dispositions of his nature, must, of necessity, be his natural state.

The duties suited to that state, and resulting from those principles and dispositions, or, in other words, from our social affections and social connections, or relation to a public system, are love of our country, resignation and obedience to the laws, public spirit, love of liberty, sacrifice of life and all to the public, and like.

Love of our country is one of the noblest passions that can warm and animate the human breast. It includes all the limited and particular affections to our parents, children, friends, neighbours, fellow-citizens, countrymen. It ought to direct and limit their more confined and partial actions within their proper and natural bounds, and never let them incroach on those sacred and first regards we owe to the great public to which we belong. Were we solitary creatures, detached from the rest of mankind, and without any capacity of comprehending a public interest, or without affections leading us to desire and pursue it, it would not be our duty to mind it, nor criminal to neglect it. But, as we are parts of the public system, and are not only capable of taking in large views of its interests, but by the strongest affections connected with it, and prompted to take a share of its concerns, we are under the most sacred ties to prosecute its security and welfare with the utmost ardor, especially in times of public trial. This love of our country does not import an attachment to any particular soil, climate, or spot of earth, where perhaps we first drew our breath, though those natural ideas are often associated with the moral ones, and, like external signs or symbols, help to ascertain and bind them; but it imports an affection to that moral system, or community, which is governed by the same laws and magistrates, and whose several parts are variously connected one with the other, and all united upon the bottom of a common interest. Perhaps indeed every member of the community cannot comprehend so large an object, especially if it extends through large provinces.
provinces, and over vast tracts of land; and still less can be formed such an idea, if there is no public, i.e., if all are subjected to the caprice and unlimited will of one man: but the preference the generality shew to their native country, the concern and longing after it which they express when they have been long absent from it, the labours they undertake and sufferings they endure to save or serve it, and the peculiar attachment they have to their countrymen, evidently demonstrate that the passion is natural, and never fails to exert itself, when it is fairly disengaged from foreign clogs, and is directed to its proper object. Where-ever it prevails in its genuine vigour and extent, it swallows up all forbid and selfish regards; it conquers the love of ease, power, pleasure and wealth; nay, when the amiable partialities of friendship, gratitude, private affection, or regard to a family come in competition with it, it will teach us bravely to sacrifice all, in order to maintain the rights and promote or defend the honour and happiness of our country.

Resignation and obedience to the laws and orders of the society to which we belong, are political duties necessary to its very being and security, without which it must soon degenerate into a state of licence and anarchy. The welfare, nay, the nature of civil society, requires that there should be a subordination of orders or diversity of ranks and conditions in it;—that certain men, or orders of men, be appointed to superintend and manage such affairs as concern the public safety and happiness;—that all have their particular provinces assigned them;—that such a subordination be settled among them, as none of them may interfere with another;—and finally, that certain rules or common measures of action be agreed on, by which each is to discharge his respective duty to govern or be governed, and all may concur in securing the order and promoting the felicity of the whole political body. Those rules of action are the laws of the community; and those different orders are the several officers, or magistrates, appointed by the public to explain them, and superintend or assist in their execution. In consequence of this settlement of things, it is the duty of each individual to obey the laws enacted, to submit to the execution of them with all due deference and homage according to their respective ranks and dignity, as to the keepers of the public peace, and the guardians of public liberty; to maintain his own rank, and perform the functions of his own station with diligence, fidelity, and incorruption.

The superiority of the higher orders, or the authority with which the state has invested them, entitle them, especially if they employ their authority well, to the obedience and submission of the lower, and to a proportionable honour and respect from all. The subordination of the lower ranks claims protection, defence, and security from the higher. And the laws, being superior to all, require the obedience and submission of all; being the last resort, beyond which there is no decision or appeal.

Public spirit, heroic zeal, love of liberty, and the other political duties, do, above all others, recommend those who practise them to the admiration and homage of mankind; because, as they are the offspring of the noblest minds, so are they the parents of the greatest blessings to society. Yet, exalted as they are, it is only in equal and free governments where they can be exercised and have their due effect: for there only does a true public prevail, and there only is the public good made the standard of the civil constitution. As the end of society is the common interest and welfare of the people associated, this end must of necessity be the supreme law or common standard by which the particular rules of action of the several members of the society towards each other are to be regulated. But a common interest can be no other than that which is the result of the common reason, or common feelings of all. Private men, or a particular order of men, have interests and feelings peculiar to themselves, and of which they may be good judges: but these may be separate from, and often contrary to the interests and feelings of the rest of the society; and therefore they can have no right to make, much less to impose, laws on their fellow-citizens, inconscient with, or opposite to, those interests and those feelings. Therefore a society, a government, a real public, truly worthy the name; and not a confederacy of banditti, a clan of lawless savages, or a band of slaves under the whip of a master; must be such a one as consists of freemen, chusing or confenting to laws themselves, or, since it often happens that they cannot assemble and act in a collective body, delegating a sufficient number of representatives, i.e. such a number as shall most fully comprehend, and most equally represent, their common feelings and common interests, to digest and vote laws for the conduct and control of the whole body the most agreeable to those common feelings and common interests.

A society thus constituted by common reason, and formed on the plan of a common interest, becomes immediately an object of public attention, public veneration, public obedience, a public and inviolable attachment, which ought neither to be seduced by bribes, nor awed by terrors; an object, in fine, of all those extensive and important duties which arise from so glorious a confederacy. To watch over such a system; to contribute all he can to promote its good by his reason, his ingenuity, his strength, and every other ability, whether natural or acquired; to resist, and to the utmost of his power defeat, every incroachment upon it, whether carried on by secret corruption, or open violence; and to sacrifice his ease, his wealth, his power, his life itself, and, what is dearer still, his family and friends, to defend or save it; is the duty, the honour, the interest, and the happiness of every citizen; it will make him venerable and beloved while he lives, be lamented and honoured if he falls in so glorious a cause, and transmit his name with immortal renown to the latest posterity.

As the people are the fountain of power and authority, the original seat of majesty, the authors of laws, and the creators of officers to execute them; if they shall find the power they have conferred abused by their traitors, their majesty violated by tyranny or by usurpation, their authority prostituted to support violence or screen corruption, the laws grown pernicious through accidents unforeseen or unavoidable, or rendered ineffectual thro' the infidelity and corruption of the executors of them; then it is their right, and what is their duty, to...
ty, to resume that delegated power, and call their trustees to an account; to redress the usurpation, and extirpate the tyranny; to restore their fullied majesty and prostituted authority; to suspend, alter, or abrogate those laws, and punish their unfaithful and corrupt officers. Nor is it the duty only of the united body, but every member of it ought, according to his respective rank, power, and weight in the community, to concur in advancing and supporting those glorious designs.

**Duty to God.**

Or all the relations which the human mind sustains, that which subsists between the Creator and his creatures, the Supreme Lawgiver and his subjects, is the highest and the best. This relation arises from the nature of a creature in general, and the constitution of the human mind in particular; the noblest powers and affections of which point to an Universal Mind, and would be imperfect and abortive without such a direction. How lame then must that system of morals be, which leaves a Deity out of the question! How disconsolate, and how destitute of its firmest support!

It does not appear, from any true history or experience of the mind's progress, that any man, by any formal deduction of his dispassionate powers, ever reasoned himself into the belief of a God. Whether such a belief is only some natural anticipation of soul; or is derived from father to son, and from one man to another, in the way of tradition; or is suggested to us in consequence of an immutable law of our nature, on beholding the august aspect and beautiful order of the universe; we will not pretend to determine. What seems most agreeable to experience is, that a sense of its beauty and grandeur, and the admirable fitness of one thing to another in its vast apparatus, leads the mind necessarily and unavoidably to a perception of design, or of a designing cause, the origin of all, by a progress as simple and natural as that by which a beautiful picture or a fine building suggests to us the idea of an excellent artist. For it seems to hold universally true, that whenever we discern a tendency or cooperation of things towards a certain end, or producing a common effect; there, by a necessary law of association, we apprehend design, a designing energy or cause: See **Metaphysics.** As we conceive this Being or First Cause before all, above all, and greater than all, we naturally, and without reasoning, ascribe to him every kind of perfection, wisdom, power, and goodness without bounds, existing through all time, and pervading all space. We apply to him those glorious epithets of our Creator, Preparator, Benefactor, the Supreme Lord and Law-giver of the whole society of rational intelligent creatures.

Not only the imperfections and wants of our being and condition, but some of the noblest instincts and affections of our minds, connect us with this great and universal nature. The mind, in its progress from object to object, from one character and prospect of beauty to another, finds some blemish or deficiency in each; and soon exhausts or grows weary and dissatisfied with its subject: it feels no character of excellency among men, equal to that pitch of esteem which it is capable of excelling; no object within the compass of human things adapted to the strength of its affection. Nor can it stop anywhere in this self-expansive progress, or find repose after its highest flights, till it arrives at a Being of unbounded greatness and worth, on whom it may employ its sublimest powers without exhausting the subject, and give scope to the utmost force and fulness of its love without fatiety or disgust. So that the nature of this Being corresponds to the nature of man; nor can his intelligent and moral powers obtain their entire end, but on the supposition of such a Being, and without a real sympathy and communication with him. The native propensity of the mind to reverence whatever is great and wonderful in nature, finds a proper object of homage in him who spread out the heavens and the earth, and who sustains and governs the whole of things. The admiration of beauty, the love of order, and the complacency we feel in goodnes, must rise to the highest pitch, and attain the full vigour and joy of their operations, when they unite in Him who is the sum and source of all perfection.

It is evident, from the slightest survey of morals, that how punctual ever one may be in performing the duties which result from our relations to mankind; yet to be quite deficient in performing those which arise from our relation to the Almighty, must argue a strange perversion of reason or depravity of heart. If imperfect degrees of worth attract our veneration, and if the want of it would imply an insensibility, or which is worse, an aversion to merit; what lameness of affection, and immorality of character, must it be, to be unaffected with, and much more to be ill-affected to, a Being of superlative worth! To love society, or particular members of it, and yet to have no sense of our connection with its Head, no affection to our common Parent and Benefactor; to be concerned about the approbation or cenure of our fellow-creatures, and yet to feel nothing of this kind towards Him who feeds and weighs our actions with unerring wisdom and justice, and can fully reward or punish them; betrays equal madness and partiality of mind. It is plain, therefore, beyond all doubt, that some regards are due to the great Father of all, in whom every lovely and adorable quality combines to inspire veneration and homage.

As it has been observed already, that our affections depend on our opinions of their objects, and generally keep pace with them, it must be of the highest importance, and seems to be among the first duties we owe to the Author of our being, "to form the least imperfect, since we cannot form perfect conceptions of his character and administration." For such conceptions, thoroughly imbibed, will render our religion rational, and our dispositions refined. If our opinions are diminutive and distorted, our religion will be superstitious, and our temper abject. The foundation, then, of all true religion is a rational faith. And of a rational faith these seem to be the chief articles: To believe, "that an infinite all-perfect Mind exists, who has no opposite nor any separate interest from that of his creatures;—that he superintends and governs all creatures and things;—that his goodnes extends to all his creatures, in different degrees indeed, according to their respective natures, but without any partiality or envy:—that he does every thing for the best, or
or in a subserviency to the perfection and happiness of the whole;—particularly, that he directs and governs the affairs of men,—insects their actions,—distinguishes the good from the bad,—loves and befriends the former,—is displeased with and pities the latter in this world,—and will, according to their respective defects, reward the one, and punish the other in the next—that, in fine, he is always carrying on a scheme of virtue and happiness through an unlimited duration,—and is ever guiding the universe through its successive stages and periods, to higher degrees of perfection and felicity.” This is true therein, the glorious scheme of divine faith; a scheme exhibited in all the works of God, and executed through his whole administration.

This faith, well-founded and deeply felt, is nearly connected with a true moral taste, and hath a powerful efficacy on the temper and manners of the theft. He who adores goodness in others, and delights in the practice of it, must be conscious of a reigning order within, a rectitude and candor of heart which dispels him to entertain favourable apprehensions of men, and, from an impartial survey of things, to presume that good order and good meaning prevail in the universe; and if good meaning and good order, then an ordering, and intending Mind, who is no enemy, no tyrant to his creatures, but a friend, a benefactor, an indulgent sovereign. On the other hand, a bad man, having nothing goodly or generous to contemplate within, no right intentions, nor honesty of heart, suspects every person and every thing; and beholding nature through the gloom of a selfish and guilty mind, is either averse to the belief of a reigning order; or, if he cannot suppress the unconquerable anticipations of a governing mind, he is prone to tarnish the beauty of nature, and to impute malvolence, or blindness and impotence at least, to the Sovereign Ruler. He turns the universe into a forlorn and horrid waste; and transfers his own character to the Deity, by ascribing to him that uncommunicative grandeur, that arbitrary or revengeful spirit which he affects or admires in himself. As such a temper of mind naturally leads to atheism, or to a superstitious ful as bad; therefore, as far as that temper depends on the unhappy creature in whom it prevails, the propensity to atheism or superstition consequent thereto must be immoral. Farther, it is true that the belief or feene of a Deity is natural to the mind, and the evidence of his existence reflected from his works to full as to strike even the most superficial observer with conviction; then the supplanting or corrupting that sense, or the want of due attention to that evidence, and, in consequence of both, a supine ignorance or affected unbelief of a Deity, must argue a bad temper, or an immoral turn of mind. In the case of invincible ignorance, or a very bad education, though nothing can be concluded directly against the character, yet whenever ill passions and habits pervert the judgment, and by perverting the judgment terminate in atheism, then the case becomes plainly criminal.

But let casuists determine this as they will, a true faith in the divine character and administration is generally the consequence of a virtuous state of mind. The man who is truly and habitually good, feels the love of order, of beauty, and goodness, in the strongest degree; and therefore cannot be insensible to those emanations of them which appear in all the works of God, nor help loving their Supreme Source and Model. He cannot but think, that He who has poured such beauty and goodness over all his works, must Himself delight in beauty and goodness, and what He delights in must be both amiable and happy. Some indeed there are, and it is pity there should be any such, who, through the unhappy influence of a wrong education, have entertained dark and unfriendly thoughts of a Deity and his administration, though otherwise of a virtuous temper themselves. However, it must be acknowledged, that such sentiments have, for the most part, a bad effect on the temper; and when they have not, it is because the undepraved affections of an honest heart are more powerful in their operation, than the speculative opinions of an ill-formed head.

But where ever right conceptions of the Deity and his providence prevail, when he is considered as the inexhausted source of light and love and joy, as acting in the joint character of a father and governor, imparting an endless variety of capacities to his creatures, and supplying them with every thing necessary to their full comple tion and happiness; what veneration and gratitude must such conceptions thoroughly believed excite in the mind! How natural and delightful must it be to one whose heart is open to the perception of truth, and of every thing fair, great, and wonderful in nature, to contemplate and adore Him, who is the First Fair, the First Great, and First Wonderful; in whom wisdom, power and goodness dwell vitally, essentially, originally, and in perfect concord! What grandeur is here to fill the most enlarged capacity, what beauty to engage the most ardent love, and what a mass of wonders in such exuberance of perfection, to astonish and delight the human mind through an unfailling duration!

If the Deity is considered as our supreme guardian and benefactor, as the father of mercies, who loves his creatures with infinite tenderness, and in a particular manner all good men, nay, who delights in goodness even in its most imperfect degrees; what resignation, what dependence, what generous confidence, what hope in God and his all-wise providence, must arise in the foul that is possessed of such amiable views of him! All those exercises of piety, and above all a superstitious efficacy and love, are directed to God as to their natural, their ultimate, and indeed their only adequate object; and though the immense obligations we have received from him may excite in us more lively feelings of divine goodness than a general and abstracted contemplation of it; yet the affections of gratitude and love are themselves of the generous disinterested kind, not the result of selfish interest, or views of reward. A perfect character, in which we always suppose infinite goodness, guided by unerring wisdom, and supported by almighty power, is the proper object of perfect love; and though that character suffrains to us the relation of a benefactor, yet the mind, deeply struck with that perfection, is quite lost amid such a blaze of beauty.
ty, and grows as it were insensible to those minutest ir-
radiations of it upon itself. To talk, therefore, of a mer-
cenary love of God, or which has fear for its principal
ingredient, is equally impious and absurd. If we do not
love the loveliest object in the universe for its own sake,
no prospect of good or fear of ill can ever inspire our ef-
ferve, or captivate our love. These affections are too
noble to be bought or sold, or barred in the way of
gain; worth, or merit, as their object, and their reward
is something similar in kind. Whoever indulges fuch
sentiments and affections towards the Deity, must be con-
firmed in the love of virtue, in a desire to imitate its all-
perfect Pattern, and in a cheerful security that all his great
concerns, those of his friends and of the universe, shall
be absolutely safe under the conduct of unerring wis-
dom and unbounded goodness. It is in his care and
providence alone that the good man, who is anxious for
the happiness of all, finds perfect serenity, a serenity
neither ruffled by partial ill, nor soured by private disap-
pointment.

When we consider the unslained purity and absolute
perfection of the divine nature, and reflect withal on the
imperfection and various blemishes of our own, we must
sink, or be convinced we ought to sink, into the deepest
humility and prostration of soul before Him who is so
wonderfully great and holy. When, farther, we call to
mind what low and languid feelings we have of the Divine
Presence and Majesty; what insensibility of his fatherly
and universal goodness, nay, what ungrateful returns we
have made to it; how far we come short of the perfection
of his law, and the dignity of our own nature; how much
we have indulged to the selfish passions, and how little to
the benevolent ones; we must be conscious that it is our
duty to repent of a temper and conduct so unworthy our
nature, and unbecoming our obligations to its Author,
and to resolve and endeavour to act a wiser and better
part for the future.

Nevertheless, from the character which his works ex-
hibit of him, from those delays or alleviations of punish-
ment which offenders often experience, and from the
merciful tenour of his administration in many other in-
fiances, the sincere penitent may entertain good hopes that
his Parent and Judge will not be strict to mark iniquity, but
will be propitious and favourable to him, if he honestly
endeavours to avoid his former practices, and subdue his
former habits, and to live in a greater conformity to the
divine will for the future. If any doubts or fears should
still remain, how far it may be consistent with the recti-
tude and equity of the divine government to let his in-
quities pass unpunished; yet he cannot think it unsuitable
to his paternal clemency and wisdom to contrive a method
of retrieving the penitent offender, that shall unite and
reconcile the majesty and mercy of his government. If
reason cannot of itself suggest such a scheme, it gives at
least some ground to expect it. But though natural reli-
gion cannot let in more light and assurance on so interes-
ting a subject, yet it will teach the humble thief to wait with
great submissiveness for any farther intimations it may please
the Supreme Governor to give of his will; examine with
candour and impartiality whatever evidence shall be pro-
posed to him of a divine revelation, whether that evidence
is natural or supernatural; to embrace it with veneration
and cheerfulnes, if the evidence is clear and convincing;
and finally, if it bring to light any new relations or con-
nections, natural religion will persuade its sincere votary
faithfully to comply with the obligations, and perform the
duties which result from those relations and connections.

—This is theism, piety, the completion of morality!

We must further observe, that all those affections which
we suppos'd to regard the Deity as their immediate and
primary object, are vital energies of the soul, and conse-
quentially exert themselves into act; and like all its other
energies, gain strength or greater activity by that exertion,
It is therefore our duty, as well as highest interest, often,
at flated times, and by decent and solemn acts, to con-
template and adore the great Original of our existence, the
Parent of all beauty, and of all good; to express our ve-
neration and love, by an awful and devout recognition of
his perfections; and to evidence our gratitude, by celebra-
ting his goodness, and thankfully acknowledging all his
benefts. It is likewise our duty, by proper exercises of
forrow and humiliation, to confess our ingratitude and
folly; to signify our dependence on God, and our con-
science in his goodness, by imploring his blessing and gra-
cious concurrence in assisting the weakens, and curing the
corruptions of our own nature; and finally, to testify our fe-
ne of his authority, and our faith in his government, by de-
voiting ourselves to do his will, and resigned ourselves to
deipofal. These duties are not therefore obligatory,
because the Deity needs or can be profited by them; but
as they are apparently decent and moral; suitable to the
relations he fulfains of our Creator, Benefactor, Law-giver
and Judge; expressive of our state and obligations; and
improving to our tempers, by making us more rational,
social, godlike, and consequently more happy.

We have now confidered internal piety, or the worship
of the mind, that which is in spirit and in truth; we shall
conclude the fection with a short account of that which is
external. External worship is founded on the fame prin-
ciples as internal, and of a ftrict moral obligation. It is
either private or public. Devotion, that is inward, or
purely intellectual, is too spiritual and abstruded an ope-
ration for the bulk of mankind. The operations of their
minds, such especially as are employed on the most sublime
immaterial objects, must be abstrued by their outward
organs, or by some help from the imagination, otherwise
they will be soon dissipated by fensible impressions, or grow
tiresome if too long continued. Ideas are such fleeting
things that they muft be fixed, and fo fubtle that they
must be expressed and delineated, as it were, by fensible
marks and images; otherwise we cannot attend at them,
nor be much affected to them. Therefore verbal adora-
tion, prayer, praise, thanking, and confeffion, are ad-
mirable aids to inward devotion, fix our attention, com-
pone and enliven our thoughts, impress us more deeply
with a fenfe of the awful prefeuce in which we are, and,
by a natural and mechanical fort of influence, tend to
heighten those devout feelings and affections which we
ought to entertain, and after this manner reduce into for-
mal and explicit act.

This holds true in an higher degree in the cafe of pub-
lic worship, where the presence of our fellow-creatures,
and the powerful contagion of the social affections, con-
spire to kindle and spread the devout flame with greater
energy.
energy. To conclude: As God is the parent and head of the social system; as he has formed us for a social state; as by one we find the best security against the ills of life, and in the other enjoy its greatest comforts; and as, by means of both, our nature attains its highest improvement and perfection: and moreover, as there are public blessings and crimes in which we all share in some degree, and public wants and dangers to which all are exposed; it is therefore evident, that the various and solemn offices of public religion, are duties of indissoluble moral obligation, among the best cements of society, the firmest prop of government, and the fairest ornament of both.

Of Practical Ethics, or the Culture of the Mind.

We have now gone through a particular detail of the several duties we owe to ourselves, to society, and to God. In considering the first order of duties, we just touched on the methods of acquiring the different kinds of goods which we are led by nature to pursue; only we left the consideration of the method of acquiring the moral goods of the mind to a feeling by itself, because of its singular importance. This section, then, will contain a brief enumeration of the arts of acquiring virtuous habits, and of eradicating vicious ones, as far as is consistent with the brevity of such a work; a subject of the utmost difficulty as well as importance in morals: to which, nevertheless, the least attention has been generally given by moral writers, especially those of a modern date. This will properly follow a detail of duty, as it will direct us to such means or helps as are most necessary and conducive to the practice of it.

In the first part of this inquiry we traced the order in which the passions shoot up in the different periods of human life. That order is not accidental, nor dependent on the caprice of men, or the influence of custom and education; but arises from the original constitution and laws of our nature; of which this is one, viz. “That sensible objects make the first strongest impressions on the mind.” These, by means of our outward organs, being conveyed to the mind, become objects of its attention on which it reflects when the outward objects are no longer present, or, in other words, when the impressions upon the outward organs cease. These objects of the mind’s reflection are called ideas or images. Towards these, by another law of our nature, we are not altogether indifferent; but correspondent movements of desire or aversion, love or hatred, affections, according as the objects of which they are images or copies made an agreeable or disagreeable impression on our organs. These ideas and affections which we experience in the first period of life, we refer to the body, or to sense; and the taste which is formed towards them, we call a sensible, or a merely natural taste; and the objects corresponding to them we in general call good or pleasant.

But, as the mind moves forward in its course, it extends its views, and receives a new and more complex set of ideas, in which it observes uniformity, variety, finitude, symmetry of parts, reference to an end, novelty, grandeur. These compose a vast train and diversity of images, which the mind compounds, divides, and moulds into a thousand forms, in the absence of those objects which first introduced it. And this more complicated imagery fuses a new train of desires and affections, full as sprightly and engaging as any which have yet appeared.

This whole class of perceptions or impressions is referred to the imagination, and forms an higher taste than the sensible, and which has an immediate and mighty influence on the finer passions of our nature, and is commonly termed a fine taste.

The objects which correspond to this taste we use to call beautiful, harmonious, great, or wonderful, or, in general, by the name of beauty.

The mind still pushing onwards, and increasing its flock of ideas, ascends to those to an higher species of objects, viz. the order and mutual relations of minds to each other, their reciprocal affections, characters, actions, and various aspects. In these it discovers a beauty, a grandeur, a decorum more interesting and alluring than in any of the former kinds. These objects, or the images of them, passing in review before the mind, do, by a necessary law of our nature, call forth another and nobler set of affections, as admiration, esteem, love, honour, gratitude, benevolence, and others of the like tribe. This class of perceptions, and their correspondent affections, we refer, because of their objects (manners,) to a moral sense; and call the taste or temper they excite, moral: and the objects which are agreeable to this taste or temper we denominate by the general name of moral beauty; in order to distinguish it from the other, which is termed natural.

These different sets of ideas or images are the materials about which the mind employs itself; which it blends, ranges, and diversifies ten thousand different ways. It feels a strong propensity to connect and associate those ideas among which it observes any similarity, or any aptitude, whether original and natural, or customary and artificial, to suggest each other. See Metaphysics.

But whatever the reasons are, whether similitude, co-existence, causality, or any other aptitude or relation, why any two or more ideas are connected by the mind at first, it is an established law of our nature, “That when two or more ideas have often started in company, they form a strong union, that it is very difficult ever after to separate them.” Thus the lover cannot separate the idea of merit from his mistress; the courtier that of dignity from his title or ribbon; the miser that of happiness from his bags. — It is these associations of worth or happiness with any set of objects or images that form our taste or complex idea of good. By another law of our nature, “our affections follow and are governed by this taste; and to these affections our character and conduct are similar and proportioned, on the general tenor of which our happiness principally depends.”

As all our leading passions, then, depend on the direction which our taste takes, and as it is always of the same train with our leading affections, it is worth while to inquire a little more particularly how these are formed, in order to detect the secret sources from whence our passions derive their principal strength, their various rises
and falls. For this will give us the true key to their management, and let us into the right method of correcting the bad, and improving the good.

No kind of objects makes so powerful an impression on us as those which are immediately impressed on our senses, or strongly painted on our imaginations. Whatever is purely intellectual, as abstracted or scientific truths, the subtle relations and difference of things, has a fainter sort of existence in the mind; and, though it may exercise and whet the memory, the judgment, or the reasoning powers, gives hardly any impulse at all to the active powers, the passions, which are the main springs of motion. On the other hand, were the mind entirely under the direction of sense, and impervious only by such objects as are present and strike some of the outward organs, we should then be precisely in the state of the brute creation, and be governed solely by instinct or appetite, and have no power to control whatever impressions are made upon us. Nature has therefore endowed us with a middle faculty, wonderfully adapted to our mixed state; which holds partly of sense, and partly of reason; being strongly allied to the former, and the common receptacle in which all the notices that come from that quarter are treasured up; and yet greatly subservient and ministerial to the latter, by giving a body, a coherence, and beauty to its conceptions. This middle faculty is called the imagination, one of the most busy and fruitful powers of the mind. Into this common storehouse are mixed all those moral images or forms which are derived from our moral faculties of perception; and there they often undergo new changes and appearances, by being mixed and wrought up with the images and forms of sensible or natural things. By this coalition of imagery, natural beauty is dignified and heightened by moral qualities and perfections, and moral qualities are at once exhibited and set off by natural beauty. The sensible beauty, or good, is refined from its dross by parings or appearing, and sensible enjoyments, we contract early a sensual relish or love of pleasure in the lower sense of the word. In order, however, to justify this relish, the mind, as it becomes open to higher perceptions of beauty and good, borrows from thence a nobler heter of images, as fine taste, generosity, social affection, friendship, good-fellowship, and the like; and, by dressing out the old pursuits with these new ornaments, gives them an additional dignity and lustre. By these ways the desire of a table, love of finery, intrigue, and pleasure, are vastly increased beyond their natural pitch, having an impulse combined of the force of the natural appetites and of the superadded strength of those passions which tend to the moral species.

—When the mind becomes more sensible to those objects or appearances, in which it perceives beauty, uniformity, grandeur, and harmony, as fine cloaths, elegant furniture, plate, pictures, gardens, houses, equipage, the beauty of animals, and particularly the attractions of the sex; to these objects the mind is led by nature, or taught by custom, the opinion and example of others, to annex certain ideas of moral character, dignity, decorum, honour, liberality, tenderness, and active or social enjoyment. The consequence of this association is, that the objects to which these are annexed, mult rise in their value, and be pursued with proportionable ardor. The enjoyment of them is often attended with pleasure; and the mere possession of them, where that is wanting, frequently draws respect from one's fellow-creatures: this respect is, by many, thought equivalent to the pleasure of enjoyment. Hence it happens, that the idea of happiness is connected with the mere possession; which is therefore eagerly sought after, without any regard to the generous use, or honourable enjoyment. Thus the passion relying on the means, not the end, i.e., losing sight of its natural object, becomes wild and extravagant.

In fine, any object, or external denomination, a staff, a garter, a cup, a crown, a title, may become a moral badge or emblem of merit, magnificence, or honour, according as these have been found or thought by the possessors or admirers of them to accompany them; yet, by the deception formerly mentioned, the merit or the conduct which entitled, or should entitle, to those marks of distinction, shall be forgot or neglected, and the badges themselves be passionately affected, or pursued, as including every excellence. If these are attained by any means, all the concomitants which nature, custom, or accidents have joined to them, will be supposed to follow of course. Thus moral ends, with which the unhappy admirer is apt to colour over his passion and views, will, in his opinion, justify the most immoral means, as profition, seduction, fraud, treachery, and every species of knavery, whether more open or more disguised.

When men are once engaged in active life, and find that wealth and power, generally called interests, are the great avenues to every kind of enjoyment, they are apt to throw in many engaging moral forms to the object of their pursuit, in order to justify their passion, and varnish over the measures they take to gratify it; as, independency on the vices or passions of others, provision and security to themselves and their enemies who are all villains, honourable service, and many other ingredients of merit. To attain such capacities of usefulness or enjoyment, what arts, nay, what meaneries can be thought blameable by those cool pursuers of interest?—Nor have they, whom the gay world is pleased to indulge with the title of men of pleasure, their imaginations less pregnant with moral images, with which they never fail to ennoble, or, if they cannot do that, to palliate their gross pursuits. Thus, admiration of wit, of sentiments and merit, friendship, love, generous sympathy, mutual confidence, giving and receiving pleasure, are the ordinary ingredients with which they feed their gallantry and pleasurable entertainments; and by which they impose on themselves, and endeavour to impose on others, that their amours are the joint issue of good sense and virtue.

These associations, variously combined and proportioned by the imagination, form the chief private passions which govern the lives of the generality; as the love of action, of pleasure, power, wealth, and fame: they influence the defensive, and affect the public passions, and raise joy
joy or sorrow, as they are gratified or disappointed. So that, in effect, these associations of good and evil, beauty and deformity, and the passions they raise, are the main hinges of life and manners, and the great sources of our happiness or misery. It is evident, therefore, that the whole of moral culture must depend on giving a right direction to the leading passions, and duly proportioning them to the value of the objects or goods pursued, under what name forever they may appear.

Now, in order to give them this right direction and due proportion, it appears, from the foregoing detail, that these associations of ideas, upon which the passions depend, must be duly regulated: that is to say, as an exorbitant passion for wealth, pleasure, or power, flows from an association or opinion that more beauty and good, whether natural or moral, enters into the enjoyment or possession of them, than really belongs to either; therefore, in restoring those passions to their just proportion, we must begin with correcting the opinion, or breaking the false association; or, in other words, we must decompose the complex phantom of happiness or good, which we fondly admire; disunite those ideas, that have no natural alliance; and separate the original idea of wealth, power, or pleasure, from the foreign mixtures incorporated with it, which enhance its value, or give it its chief power to enchant and seduce the mind. For instance, let it be considered how poor and inconsiderable a thing wealth is, if it be disjoined from real use, or from ideas of capacity in the possessor to do good, from independence, generosity, provision for a family or friends, and social communication with others. By this standard let its true value be fixed; let its misapplication, or unbenevolent enjoyment, be accounted for; and infamous; and nothing worthy or estimable be ascribed to the mere possession of it, which is not borrowed from its generous use.

If that complex form of good which is called pleasure, engages us, let it be analyzed into its constituent principles, or those allurements it draws from the heart and imagination, in order to heighten the low part of indulgence; let the separate and comparative moment of each be distinctly ascertained, and deduced from that gross part; and this remainder of the accumulative enjoyment will dwindle down into a poor, insipid, transitory thing. In proportion as the opinion of the good purposed abates, the admiration must decay, and the passion lose strength of course. One effectual way to lower the opinion, and consequently to weaken the habit founded on it, is to practice lesser pieces of self-denial, or to abstain, to a certain pitch, from the pursuit or enjoyment of the favourite object; and, that this may be the more easily accomplished, one must avoid those occasions, that company, those places, and the other circumstances that inflamed one; and endeared the other: And, as a counter-proofs, let higher or even different enjoyments be brought in view, other passions played upon the former, different places frequented, other exercises tried, company kept with persons of a different or more correct way of thinking both in natural and moral subjects.

As much depends on our setting out well in life, let the youthful fancy, which is apt to be very florid and luxuriant, be early accustomed, by instruction, example, and significant moral exercises, nay, by looks, gestures, and every other testimony of just approbation or blame, to annex ideas of merit, honour, and happiness—not to birth, dreads, rank, beauty, fortune, power, popularity, and the like outward things—but to moral and truly virtuous qualities, and to those enjoyments which spring from a well-informed judgment, and a regular conduct of the affections, especially those of the social and disinterested kind. Such dignified forms of beauty and good, often fuggelled, and, by moving pictures and examples, warmly recommended to the imagination, enforced by the authority of conscience, and demonstrated by reason to be the surest means of enjoyment, and the only independent, undepriable and durable goods, will be the best counter-balance to meaner passions, and the firmest foundation and security to virtue.

It is of great importance to the forming a just taste, or pure and large conceptions of happiness, to study and understand human nature well, to remember what a complicated system it is, particularly to have deeply imprinted on our mind that gradation of fennis, faculties, and powers of enjoyment formerly mentioned, and the subordination of goods resulting from thence, which nature points out, and the experience of mankind confirms; who, when they think seriously, and are not under the immediate influence of some violent prejudice or passion, prefer not the pleasures of action, contemplation, society, and most exercises and joys of the moral kind, as friendship, natural affection, and the like, to all sensual gratifications whatsoever? Where the different species of pleasure are blended into one complex form, let them be accurately distinguished, and be referred each to its proper faculty and sense, and examined apart what they have peculiar, what common with others, and what foreign and adventitious. Let wealth, grandeur, luxury, love, fame, and the like, be tried by this test, and their true alloy will be found out. Let it be farther considered, whether the mind may not be easy, and enjoy itself greatly, though it want many of those elegancies and superfluities of life which some possess, or that load of wealth and power which others eagerly pursue, and under which they groan. Let the difficulty of attaining, the precariousness of possession, and the many abatements in enjoying overgrown wealth and envied greatness, of which the weary possessors so frequently complain, as the hurry of busies, the burden of company, of paying attendance to the few, and giving it to the many, the cares of keeping, the fears of losing, and the desires of increasing what they have, and the other troubles which accompany this pitiful drudgery and pompous servitude; let these and the like circumstances be often considered that are conducive to the removing or lessening the opinion of such goods, and the attendant passion or set of passions will decay of course.

Let the peculiar bent of our nature and character be observed, whether we are most inclined to form associations and relish objects of the sensible, intellectual, or moral kind. Let that which has the ascendant be particularly watched; let it be directed to right objects, be improved by proportioned exercises, and guarded by proper checks from an opposite quarter. Thus, the sensible turn
turn may be exalted by the intellectual and a taste for the beauty of the fine arts, and both may be made subservient to convey and rivet sentiments highly moral and public-spirited. This inward fury must extend to the strength and weakness of one's nature, one's condition, connections, habits, fortune, studies, acquaintance, and the other circumstances of one's life; from which every man will form the justest estimate of his own dispositions and character, and the best rules for correcting and improving them. And, in order to do this with more advantage, let those times or critical seasons be watched when the mind is best disposed towards a change, and let them be improved by vigorous resolution, promises, or whatever else will engage the mind to persevere in virtue. Let the conduct, in fine, be often reviewed, and the causes of its corruption or improvement be carefully observed.

It will greatly conduce to refine the moral taste and strengthen the virtuous temper, to accustom the mind to the frequent exercise of moral sentiments and determinations, by reading history, poetry, particularly of the picturesque and dramatic kind, the study of the fine arts; by converting with the most eminent for good-fence and virtue; but, above all, by frequent and repeated acts of humanity, compassion, friendship, politeness, and hospitality. It is exercise gives health and strength. He that reasons most frequently, becomes the wisest, and most enjoys the pleasures of wisdom. He who is most often affected by objects of compassion in poetry, history, or real life, will have his soul most open to pity and its delightful pains and duties. So he also who practices most diligently the offices of kindness and charity, will by it cultivate that disposition, from whence all his pretensions to personal merit must arise, his present and his future happiness.

An useful and honourable employment in life will administer a thousand opportunities of this kind and greatly strengthen a sense of virtue and good affections, which must be nourished by right training, as well as our understandings. For such an employment, by enlarging one's experience, giving an habit of attention and caution, or obliging one, from necessity or interest, to keep a guard over the passions, and study the outward decencies and appearances of virtue, will by degrees produce good habit, and at length infinuate the love of virtue and honestly for its own sake.

It is a great inducement to the exercise of benevolence, to view human nature in a favourable light, to observe the characters and circumstances of mankind on the fairest sides; to put the best constructions on their actions they will bear, and to consider them as the result of partial and mistaken, rather than ill affections, or, at worst, as the excesses of a pardonable self-love, seldom or never the effects of pure malice.

Above all, the nature and consequences of virtue and vice, their consequences being the law of our nature and will of heaven; the light in which they appear to our supreme Parent and Law-giver, and the reception they will meet with from him; must be often attended to. The exercises of piety, as adoration and praise of the Divine Excellence, invocation of and dependence on his aid, confession, thanksgiving, and resignation, are habitually to be indulged, and frequently performed, not only as medicinal, but highly improving to the temper.

To conclude: It will be of admirable efficacy towards eradicating bad habits, and implanting good ones, frequently to contemplate human life as the great nursery of our future and immortal existence, as that state of probation in which we are to be educated for a divine life; to remember that our virtues or vices will be immortal as ourselves, and influence our future as well as our present happiness, and therefore that every disposition and action is to be regarded as pointing beyond the present to an immortal duration. An habitual attention to this wide and important connection will give a vast compass and dignity to our sentiments and actions, a noble superiority to the pleasures and pains of life, and a generous ambition to make our virtue as immortal as our being.

Motives to Virtue from personal Happiness.

We have already considered our obligations to the practice of virtue, arising from the constitution of our nature, by which we are led to approve a certain order andconomy of affections, and a certain course of action correspondent to it. But besides this, there are several motives which strengthen and secure virtue, though not themselves of a moral kind. These are, its tendency to personal happiness, and the contrary tendency of vice. "Personal happiness arises, either from the state of a man's own mind, or from the state and disposition of external causes towards him."

We shall first examine the "tendency of virtue to happiness with respect to the state of a man's own mind."—This is a point of the utmost consequence in morals; because, unless we can convince ourselves, or shew to others, that, by doing our duty, or fulfilling our moral obligations, we consult the greatest satisfaction of our own mind, or our highest interest on the whole, it will raise strong and often insurmountable prejudices against the practice of virtue, especially whenever there arises any appearance of opposition between our duty and our satisfaction or interest. To creatures so dearful of happiness and averse to misery as we are, and often so oddily situated amidst contending passions and interests, it is necessary that virtue appear not only an honourable, but a pleasing and beneficent form. And in order to justify our choice to ourselves, as well as before others, we must ourselves feel, and be able to avow in the face of the whole world, that her ways are ways of pleasantness, and her paths the paths of peace. This will shew, beyond all contradiction, that we not only approve, but can give a sufficient reason for what we do.

Let a man in a cool hour, when he is disengaged from business, and undisturbed by passion, as such cool hours will sometimes happen, sit down, and seriously reflect with himself what state or temper of mind he would choose to feel and indulge, in order to be easy and to enjoy himself. Would he choose, for that purpose, to be in a constant dissipation and hurry of thought; to be disturbed in the exercise of his reason; to have various, and often interfering phantoms of good playing before his imagination, soliciting and distracting him by turns, now soothing him with
with amusing hopes, then torturing him with anxious fears; and to approve this minute what he shall condemn the next? Would he chuse to have a strong and painful sense of every petty injury; quick apprehensions of every impending evil; incessant and insatiable desires of power, wealth, honour, pleasure; an irreconcilable antipathy against all competitors and rivals; insatiable and tyrannical dispositions to all below him; fawning, and at the same time envious, dispositions to all above him; with dark suspicions and jealousies of every mortal? Would he chuse neither to love, nor to be beloved of any; to have no friend in whom to confide, or with whom to interchange his sentiments or designs; no favourite, on whom to shower his kindnecfs, or vent his passions; in fine, to be conscious of no merit with mankind, no affection from any creature, no good affection to his Maker, no concerns for or hopes of his approbation; but, instead of all these, to hate, and know that he is hated, to contempt, and know that he is contemned by all; by the good because he is so unlike, and by the bad because he is so like themselves; to hate or to dread the very Being that made him; and, in short, to have his breast the prey of pride and passion, petulance and revenge, deep melancholy, cool malignity, and all the other furies that ever overpoffed and tortured mankind?—Would our calm inquirer after happiness pitch on fhuch a state, and such a temper of mind, as the most likely means to put him in possession of his deified eafe and self-enjoyment?

Or would he rather chuse a ferene and eafy flow of thought; a reason clear and composed; a judgment unbiassed by prejudice, and undistracted by passion; a sober and well-governed fancy, which presents the images of things true and unmixed with delusive and unnatural charms, and therefore administers no improper or dangerous fuel to the passions, but leaves the mind free to chufe or reject, as becomes a reasonable creature; a sweet and sedate temper, not easily ruffled by hopes or fears, prone neither to fulpicion nor revenge, apt to view men and things in the fairest lights, and to bend gently to the humours of others rather than obstinately to contend with them? Would he chuse such moderation and continence of mind, as neither to be ambitious of power, fond of honours, covetous of wealth, nor a flave to pleasure; a mind of course neither elated with successes, nor dejected with disappojgment; such a modest and noble spirit as supports power without in perlion, wears honours without out pride, ufs wealth without profusion or parsimony; and rejoices more in giving than in receiving pleasure; such fortitude and equanimity as rises above misfortunes, or turns them into blessings; such integrity and greatness of mind, as neither flatters the vices, nor triumphs over the follies of men; as equally spares fervitude and tyranny, and will neither engage in low defigns, nor abet them in others? Would he chufe, in fine, such mildnedfs and benignity of heart as takes part in all the joys, and refuses none of the sorrows of others; stands well affected to all mankind; is conscious of meritmg the efteeinc of all, and of being beloved by the best; a mind which delights in doing good without any shew, and yet arrogates nothing on that account; rejoices in loving and being beloved by its Maker, acts ever under his eye, reigns

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being sensibly alive over the whole system, his heart receives and becomes responsive to every touch given to any part. So that he gathers contentment and delight from the pleased and happy state of those around him, from accounts and relations of such happiness, from the very countenances, gestures, voices, and sounds even of creatures foreign to our kind, whose signs of joy and contentment he can in any way discern.

Nor do those generous affections stop any other natural source of joy whatever, or deaden his fens of any innocent gratification. They rather keep the several fenses and powers of enjoyment open and indigested, intense, and uncorrupted by riot or abuse; as is evident to any one who considers the diffipated unfeeling state of men of pleasure, ambition, or interest, and compares it with the serene and gentle state of a mind at peace with itself, and friendly to all mankind, unrufted by any violent emotion, and fitile to every good-natured and alluring joy.

It were easy, by going through the different sorts of affections, to shew, that it is only by maintaining the proportion settled there that the mind arrives at true repose and satisfaction. If fear exceeds that proportion, it sinks into melancholy and dejection. If anger passes just bounds, it ferment into rage and revenge, or subsides into a sullen corroding gloom, which embitters every day; and renders one excessively fitile to every ill. The private passions, the love of honour especially, whose impulses are more generous as its effects are more diffuse, are instruments of private pleasure; but if they are disproportioned to our wants, or to the value of the several objects, or to the balance of other passions equally necessary and more amicable, they become instruments of intense pain and misery. For, being now delirious of that counterpoise which held them at a due pitch, they grow turbulent, peevish, and revengeful, the cause of constant restlessness and torment, sometimes flying out into a wild delirious joy, at other times settling into a deep splanetic grief. The concert between reason and passion is then broke; all is dissonance and distraction within. The mind is out of frame, and feels an agony proportional to the violence of the reigning passion.

The cause is much the same, or rather worse, when any of the particular kind affections are out of their natural order and proportion; as happens in the case of effeminate pity, exorbitant love, parental dotage, or any party passion, where the just regards to society are supplanted. The more social and disinterested the passion is, it breaks out into the wilder excesses, and makes the more dreadful havoc, both within and abroad, as is but too apparent in those cafes where a false species of religion, honour, zeal, or party-rage, has feized on the natural enthusiasm of the mind, and worked it up to madness. It breaks through all ties natural and civil, counteracts the most sacred and solemn obligations, silences every other affection whether public or private, and transforms the most gentle natures into the most savage and inhuman.

Whereas the man who keeps the balance of affection even, is easy and serene in his motions; mild, and yet affectionate; uniform and consistent with himself; is not liable to disagreeable collisions of interests and passions; gives always place to the most friendly and humane affections; and never to dispositions or acts of restraint, but on high occasions, when the security of the private, or welfare of the public system, or the great interests of mankind necessitiously require a noble indignation; and even then he observes a just measure in wrath; and last of all, he proportions every passion to the value of the object he affects, or to the importance of the end he pursues.

To sum up this part of the argument, the honest and good man has eminently the advantage of the knavish and selfish wretch in every respect. The pleasures which the last enjoys flow chiefly from external advantages and gratifications; are superficial and transitory; dashed with long intervals of satiety, and frequent returns of remorse and fear; dependent on favourable accidents and conjunctures; and subjected to the humours of men. But the good man is satisfied from himself; his principal passions lie within, and therefore beyond the reach of the caprice of men or fortune; his enjoyments are exquisite and permanent; accompanied with no inward checks to damp them, and always with ideas of dignity and self-approbation; may be tasted at any time, and in any place. The gratifications of vice are turbulent and unnatural, generally arising from the relief of passions in themselves intolerable, and inflating in tormenting reflections; often irritated by disappointment, always inflamed by enjoyment, and yet ever cloyed with repetition. The pleasures of virtue are calm and natural; flowing from the exercise of kind affections, or delightful reflections in consequence of them; not only agreeable in the prospect, but in the present feeling? they never satiate, or lose their relish; nay, rather the admiration of virtue grows stronger every day; and not only is the desire but the possession of it purchased without a bribe, and possessed in the humblest as well as the most triumphant fortune; they can bear the strictest review, do not change with circumstances, nor grow old with time. Force cannot rob, nor fraud cheat us of them; and, to crown all, instead of abating, they enhance every other pleasure.

But the happy consequences of virtue are seen, not only in the internal enjoyments it affords a man, but "in the favourable disposition of external causes towards him, to which it contributes."

As virtue gives the sober possession of one's self and the command of one's passions, the consequence must be, heart's ease, and a fine natural flow of spirits, which conduct more than anything else to health and long life. Violent passions, and the excesses they occasion, gradually impair and wear down the machine. But the calm, placid state of a temperate mind, and the healthful exercises in which virtue engages her faithful votaries, preserve the natural functions in full vigour and harmony, and exhilarate the spirits, which are the chief instruments of action.

It may by some be thought odd to affect, that virtue is no enemy to a man's fortune in the present state of things.
things.—But if, by fortune, be meant a moderate or competent share of wealth, power, or credit, not overgrown degrees of them, what should hinder the virtuous man from obtaining that? He cannot cringe or fawn, it is true; but he can be civil and obliging as well as the knave: and purely, his civility is more alluring, because it has more manifest grace in it than the mean adulation of the other: he cannot cheat or undermine; but he may be cautious, provident, watchful of occasions, and equally prompt with the rogue in improving them: he scorces to prostitute himself as a pander to the passions, or as a tool to the vices of mankind; but he may have as found an understanding, and as good capacities for promoting their real interests, as the veriest court-flave; and then, he is more faithful and true to those who employ him. In the common course of business, he has the same chances with the knave of acquiring a fortune, and rising in the world. He may have equal abilities, equal industry, equal attention to business; and in other respects he has greatly the advantage of him. People love better to deal with him; they can trust him more; they know he will not impose on them, nor take advantage of them, and can depend more on his word than on the oath or strongest securities of others. Whereas what is commonly called cunning, which is the offspring of ignorance, and constant companion of knavery, is not only a mean-spirited, but a very short-sighted, and a fundamental obstacle in the road of business. It may procure indeed immediate and petty gains; but it is attended with dreadful abatements, which do more than over-balance them, both as it links a man's credit when discovered, and cramps that largeness of mind, which extends to the remotest as well as the nearest interest, and takes in the most durable equally with the most transient gains. It is therefore easy to see how much a man's credit and reputation, and consequently his success, depend on his honesty and virtue.

With regard to security and peace with his neighbours, it may be thought, perhaps, that the man of a quiet forgiving temper, and a flowing benevolence and courtesy, is much exposed to injury and fronts from every proud or peevish mortal who has the power or will to do mischief. If we suppose, indeed, this quietness and gentleness of nature accompanied with cowardice or pusillanimity, this may often be the case; but in reality, the good man is bold as a lion, and so much the bolder for being the calmer. Such a person will hardly be a butt to mankind. The ill-natured will be afraid to provoke him, and the good-natured will not incline to do it. Besides, true virtue, which is conducted by reason, and exerted gracefully and without parade, is a most infinuating and commanding thing; if it cannot disarm malice and reformation at once, it will wear them out by degrees, and subdue them at length. How many have, by favours, and prudently yielding, triumphed over an enemy who would have been inflamed into tenfold rage by the fiercest opposition? In fine, goodness is the most universally popular thing that can be.

To conclude, the good man may have some enemies, but he will have more friends; and having given so many marks of private friendship or public virtue, he can hardly be deftite of a patron to protect, or a fanctuary to entertain him, or to entertain or protect his children when he is gone. Though he should have little else to leave them, he bequeaths them the fairest, and generally the most unenvied, inheritance of a good name; which, like good feed sown in the field of futurity, will often raise up unfulfilled friends, and yield a benevolent harvest of unexpected charities. But should the fragrance of the parent's virtue prove offensive to a perverse or envious age, or even draw perfecution on the friendless orphans, there is One in heaven, who will be more than a father to them, and recompence their parent's virtues by showering down blessings on them.

Motives to Virtue from the Being and Providence of God.

Besides the interesting motive mentioned in the last section, there are two great motives to virtue, firstly connected with human life, and resulting from the very constitution of the human mind. The first is the being and providence of God; the second is the immortality of the soul, with future rewards and punishments.

It appears from what has been said, that man, by the constitution of his nature, is designed to be a religious creature. He is intimately connected with the Deity, and necessarily dependent on him. From that connection and necessary dependence result various obligations and duties; without fulfilling which, some of his sublimest powers and affections would be incomplete and abortive. If he be likewise an immortal creature, and if his present conduct shall affect his future happiness in another state as well as in the present; it is evident, that we take only a partial view of the creature if we leave out this important property of his nature, and make a partial estimate of human life if we strike out of the account, or overlook that part of his duration which runs out into eternity.

It is evident, that "to have a respect to the Deity in our temper and conduct, to venerate and love his character, to adore his goodness, to depend upon and resign ourselves to his providence, to seek his approbation, and act under a sense of his authority, is a fundamental part of moral virtue, and the completion of the highest designation of our nature."

But as piety is an essential part of virtue, so likewise it is a great support and enforcement to the practice of it. To contemplate and admire a being of such transcendent dignity and perfections as God, must naturally and necessarily open and enlarge the mind, give a freedom and ampleness to its powers, and a grandeur and elevation to its aims. For, "the greatness of an object, and the excellency of the act of any agent about a transcendent object, doth mightily tend to the enlargement and improvement of his faculties." Little objects, mean company, mean cares, and mean business, cramp the mind, contract its views, and give it a creeping air and deportment. But when it soars above mortal cares and mortal pursuits into the regions of divinity, and converses with the Greatest and Beh of Beings, it spreads itself into a wider compass, takes higher flights in reason and goodness, and becomes Godlike in its air and manners. Virtue is, if one may say so, both the effect and cause of largeness of mind. It requires
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requires that one think freely, and act nobly. Now, what can conduce more to freedom of thought and dignity of action, than to conceive worthily of God, to reverence and adore his unrivalled excellency, to imitate and transfer his excellency into our own nature, to remember our relation to him, and that we are the image and representatives of his glory to the rest of the creation? Such feelings and exercises must and will make us scorn all actions that are base, unhandsome, or unworthy our state; and the relation we stand in to God will irradiate the mind with the light of wisdom, and enable it with the liberty and dominion of virtue.

The influence and efficacy of religion may be considered in another light. We all know that the presence of a friend, a neighbour, or any number of spectators, but especially an august assembly of them, uses to be a considerable check upon the conduct of one who is not lost to all sense of honour and shame, and contributes to restrain many irregular fancies of passion. In the same manner we may imagine, that the awe of some Superior Mind, who is supposed privy to our secret conduct, and armed with full power to reward or punish it, will impose a restraint on us in such actions as fall not under the control or animadversion of others. If we go still higher, and suppose our inmost thoughts and darkest designs, as well as our most secret actions, to lie open to the notice of the Supreme and Universal Mind, who is both the spectator and judge of human actions; it is evident, that the belief of so august a presence, and such awful inspection, must carry a restraint and weight with it proportioned to the strength of that belief, and be an additional motive to the practice of many duties which would not have been performed without it.

It may be observed farther, that "to live under an habitual sense of the Deity and his great administration, is to be conversant with wisdom, order, and beauty, in the highest subjects, and to receive the delightful reflections and benign feelings which these excite, while they irradiate upon him from every scene of nature and providence." How improving must such views be to the mind, in dilating and exalting it above those puny interests and competitions which agitate and enflame the bulk of mankind against each other!—

Motive to Virtue from the Immortality of the Soul, &c.

The other motive mentioned was the immortality of the soul, with future rewards and punishments. The metaphysical proofs of the soul's immortality, are commonly drawn—from its simple, uncompound, and indivisible nature; from whence it is concluded, that it cannot be corrupted or extinguished by a dissolution or destruction of parts:—from its having a beginning of motion within itself; whence it is inferred, that it cannot discontinue and lose its motion—from the different properties of matter and mind; the fluggishness and inactivity of one, and the immense activity of the other; its prodigious flight of thought and imagination; its penetration, memory, foresight, and anticipations of futurity; from whence it is concluded, that a being of so divine a nature cannot be extinguished. But as these metaphysical proofs depend on intricate reasonings concerning the nature, properties, and distinction of body and mind, with which we are not very well acquainted, they are not obvious to ordinary understandings, and are seldom convincing, even to those of higher reach, as not to leave some doubts behind them. Therefore, perhaps, it is not so safe to rest the proof of such an important article on what many may call the subtleties of school-learning. Those proofs which are brought from analogy, from the moral constitution and phenomena of the human mind, the moral attributes of God, and the present course of things, and which are therefore called the moral arguments, are the plainest, and generally the most satisfying. We shall select only one or two from the rest.

In tracing the nature and definition of any being, we form the surest judgment from his powers of action, and the scope and limits of these, compared with his state, or with that field in which they are exercised. If this being passes through different states or fields of action, and we find a succession of powers adapted to the different periods of his progress, we conclude that he was designed for those successive states, and reckon his nature progressive. If, besides the immediate set of powers which fit him for action in his present state, we observe another set which appears superfluous if he was to be confined to it, and which point to another or higher one, we naturally conclude, that he is not designed to remain in his present state, but to advance to that for which those supernumerary powers are adapted. Thus we argue, that the insect, which has wings forming or formed, and all the apparatus proper for flight, is not designed always to creep on the ground, or to continue in the torpid state of adhering to a wall, but is designed in its season to take its flight in air. Without this farther definition, the admirable mechanism of wings, and the other apparatus, would be useless and absurd. The same kind of reasoning may be applied to man, while he lives only a sort of vegetative life in the womb. He is furnished even there with a beautiful apparatus of organs, eyes, ears, and other delicate senses, which receive nourishment indeed, but are in a manner folded up, and have no proper exercise or use in their present confinement. Let us suppose some intelligent spectator, who never had any connection with man, nor the least acquaintance with human affairs, to see this odd phenomenon; a creature formed after such a manner, and placed in a situation apparently unsuitable to such various machinery; must he not be strangely puzzled about the use of his complicated structure, and reckon such a profusion of art and admirable workmanship lost on the subject; or reason, by way of anticipation, that a creature, endowed with such various, yet unexerted capacities, was designed for a more enlarged sphere of action, in which those latent capacities shall have full play? The vast variety, and yet beautiful symmetry and proportions, of the several parts and organs by which the creature is endowed, and their apt cohesion with, and dependence on, the curious receptacle of their life and nourishment, would forbid his concluding the whole to be the birth of chance, or the bungling effort of an unskilful artist, at least would make him demur a while at so harrowing a sentence. But if, while he is in this state of uncertainty, we suppose him to see the babe, after a few successful struggles,
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are in the womb. Nay, those who on an aspiring genius have added all the affinities of art, leisure, and the most liberal education, what narrow prospects can even they take of this unbounded scene of things from that little eminence on which they stand? And how eagerly do they still grasp at new discoveries, without any satisfaction or limit to their ambition?

But should it be said, that man is made for action, and not for speculation, or fruitless searches after knowledge; we ask, For what kind of action? Is it only for bodily exercises; or for moral, political, and religious ones? Of all these he is capable; yet, by the unavoidable consequences of his lot, he is tied down to the former; and has hardly any leisure to think of the latter; or, if he has, wants the proper instruments of exerting them. The love of virtue, of one’s friends and country, the generous sympathy with mankind, and heroic zeal of doing good, which are all so natural to great and good minds, and some traces of which are found in the lowest, are seldom united with proportioned means or opportunities of exercising them; so that the moral spring, the noble energies and impulses of the mind, can hardly find proper scope, even in the most fortunate condition; but are much depressed in some, and almost entirely restrained in the generality, by the numerous clogs of an indigent, sickly, or embarrassed life. Were such mighty powers, such Godlike affections planted in the human breast, to be folded up in the narrow womb of our present existence, never to be produced into a more perfect life, nor to expatiate in the ample career of immortality?

Let it be considered, at the same time, that no perfection, no enjoyment within the round of mortal things, is commenurate to the desires, or adequate to the capacities of the mind. The most envied condition has its abatements; the happiest conjunction of fortune leaves many wishes behind; and after the highest gratifications, the mind is carried forward in pursuit of new ones without end. Add to all, the fond desire of immortality, the secret dread of non-existence, and the high unremitting pulse of the soul beating for perfection. Joined to the improbability or the impossibility of attaining it here; and then judge whether this elaborate structure, this magnificent apparatus of inward powers and organs, does not plainly point out an hereafter, and intimate eternity to man? Does nature give the finishing touches to the leisuer and ignoble infinaces of her scull, and raise every other creature to the maturity and perfection of his being; and shall she leave her principal workmanship unfinished?

Does the carry the vegetative and animal life in man to their full vigour, and highest deification; and shall she suffer his intellectual, his moral, his divine life to fade away, and be for ever extinguished? Would such abortions in the moral world be congruous to that perfection of wisdom and goodnes which upholds and adorns the natural?

We must therefore conclude, from this detail, that the present state, even at its best, is only the womb of man’s being, in which the noblest principles of his nature are in a manner fettered or secluded from a correspondent sphere of action; and therefore designed for a future and unbounded state, where they shall emancipate themselves, and
and exert the fulness of their strength. The most accomplished mortal, in this low and dark appartment of nature, is only the rudiments of what he shall be, when he takes his eternal flight, and puts on immortality. Without a reference to that state, man were a mere abortion, a rude unfinishéd embryo, a monster in nature. But this being once supposéd, he still maintains his rank, of the matter-piece of the creation; his latent powers are all suitable to the harmony and progress of nature; his noble aspirations, and the pains of his dissolution, are his efforts towards a second birth, the pangs of his delivery into light, liberty, and perfection; and death his discharge from gaol, his separation from his fellow-prisoners, and introduction into the assembly of those heroic spirits who are gone before him, and of their great eternal Parent. The fetters of his mortal coil being loosed, and his prison-walls broke down, he will be bare and open on every side to the admission of truth and virtue, and their fair attendant happiness; every vital and intellectual spring will evolve itself, with a divine elasticity, in the free air of heaven. He will not then peep at the universe and its glorious Author through a dark grate, or a grofs medium, nor receive the reflections of his glory through the strait openings of fenitive organs; but will be all eye, all ear, all ethereal and divine feeling. Let one part, however, of the analogy be attended to; That, as in the womb we receive our original constitution, form, and the essential flamina of our being, which we carry along with us into the light, and which greatly affect the succeeding periods of our life; so our temper and condition in the future life will depend on the con duct we have observed, and the character we have formed in the present life. We are here in miniature what we shall be at full length hereafter. The first rude sketch, or out-lines of reason and virtue, must be drawn at present, to be afterwards enlarged to the stature and beauty of angels.

This, if duly attended to, must prove not only a guard, but an admirable incentive to virtue. For he who faithfully and ardentely follows the light of knowledge, and pangs after higher improvements in virtue, will be wonder fully animated and inflamed in that pursuit, by a full conviction that the scene does not close with life;—that his struggles arising from the weaknesses of nature, and the strength of habit, will be turned into triumphs;—that his career in the tracts of wisdom and goodness will be both swifter and smoother;—and those generous arors with which he glows towards heaven, i. e. the perfection and immortality of virtue, will find their adequate object and exercise in a sphere proportionally enlarged, incorruptible, immortal. On the other hand, what an inexplicable dump must it be to the good man, to dread the total extinction of that light and virtue, without which life, may immortality itself, were not worth a single wish?

Many writers draw their proofs of the immortality of the soul, and of a future state of rewards and punishments, from the unequal distribution of these here. It cannot be dissembled that wicked men often escape the outward punishment due to their crimes, and do not feel the inward in that measure their demerit seems to require, partly from the callousness induced upon their nature by the habits of vice, and partly from the dissipation of their minds abroad by pleasure or business; and sometimes good men do not reap all the natural and genuine fruits of their virtue, through the many unforeseen or unavoidable calamities in which they are involved. This, no doubt, upon the supposition of an all-wise and good Providence, were an argument, and a strong one too, for a future state, in which those inequalities shall be corrected. But unless we suppose a propitious good order in the present scene of things, we weaken the proof of the divine administration, and the presumption of better order in any future period of it.

Virtue has present rewards, and vice present punishments, annexed to it; such rewards and punishments as make virtue, in most cases that happen, far more eligible than vice; but, in the infinite variety of human contingencies, it may sometimes fall out, that the inflexible practice of virtue shall deprive a man of considerable advantages to himself, his family, or friends, which he might gain by a well-timed piece of roguery, supposo by betraying his trust, voting against his conscience, selling his country, or any other crime where the security against discovery shall heighten the temptation. Or, it may happen, that a strict adherence to his honour, to his religion, to the cause of liberty and virtue, shall expose him, or his family, to the loss of every thing, nay to poverty, slavery, death itself, or to torments far more intolerable. Now, what shall secure a man's virtue in circumstances of such trial? What shall enforce the obligations of conscience against the allurements of so many interests, the dread of so many and so terrible evils, and the almost insurmountable aversion of human nature to excessive pain? The conflict is the greater, when the circumstances of the crime are such as easily admit a variety of alleviations from necessity, natural affection, love to one's family, or friends, perhaps in indigence: These will give it even the air of virtue. Add to all, that the crime may be thought to have few bad consequences,—may be easily concealed,—or imagined possible to be retrieved in a good measure by future good conduct.

It is obvious to which side most men will lean in such a case, and how much need there is of a balance in the opposite scale, from the consideration of a God, of a providence, and of an immortal state of retribution, to keep the mind firm and incorrupt in those or like instances of singular trial or distress.

But without supposing such peculiar instances, a sense of a Governing Mind, and a persuasion that virtue is not only befriended by him here, but will be crowned by him hereafter with rewards suitable to its nature, vaft in themselves, and immortal in their duration, must be not only a mighty support and incentive to the practice of virtue, but a strong barrier against vice. The thoughts of an almighty Judge, and of an impartial future reckoning, are often alarming, inexplicably so, even to the stoutest offenders. On the other hand, how supporting must it be to the good man, to think that he acts under the eye of his Friend, as well as Judge! How improving, to consider the present state as connected with a future one, and every relation in which hestands as a school of discipline for his affections, every trial as the exercise of some virtue, and the virtuous deeds which result from both as introductory to higher scenes of action and enjoyment! Finally, how transporting
MORAL sense, that whereby we perceive what is good, virtuous, and beautiful in actions, manners, and characters. See Morals.

MORALITY. See Moral Philosophy.

MORASS, a low, moist land, which receives the waters from the higher grounds without having any defcent to carry them off.

MORAVIA, a marquise, or province in Bohemia, bounded by Silesia on the north-east, by Hungary and Austria on the south, and by Bohemia on the north-west.

MORAVIANS, a sect of Protestants, who have been settled for a considerable time past at Hernhuth in Germany, and have of late years spread themselves over most of our American colonies, as well as in several parts of England, where they are permitted to settle by a late act of parliament. They have a kind of church-government peculiar to themselves, and are commonly known by the name of Unitas Fratrum, or The Brethren. They profess the utmost veneration for our bleffed Saviour, whom they consider as their immediate Head and Director; enjoin the most implicit obedience to the rulers of their church; and are said to practise much brotherly love amongst one another.

MORBID, among physicians, signifies diseased or corrupt; a term applied either to an unfound constitution, or to those parts or humours that are infected by a disease.

MORDELLA, in zoology, a genus of the coleoptera class of insects. The antennæ are thread-shap'd, and serrated; the head is defcended under the neck; the pappi are elevated, compressed, and obliquely blunt'd; and the elytra are bent backwards near the apex. There are six species, all natives of different parts of Europe.

MOREA, the ancient Peloponnesus, is a province of European Turkey, and is a peninsula about one hundred and eighty miles long, and one hundred and thirty broad, bounded by the gulphs of Lepanto and Eginia on the north; by the Egean sea, or Archipelago, on the east; and by the Mediterranean on the south and west.

MORESK, or morisco, is a kind of painting, carving, &c. done after the manner of the Moors; consisting of several grotesque pieces and compartments, promiscuously mingled, not containing any perfect figure of a man, or other animal; but a wild resemblance of birds, beasts, trees, &c.

MORAY, in ichthyology. See Squalus.

MORINA, in botany, a genus of the diandria monogynia class. The corolla is unequal; the calyx of the fruit consists of one dentated leaf; the calyx of the flower is bifid; and there is but one seed under the flower-calix. There is but one species, a native of Peru.

MORINDA, in botany, a genus of the polyandria monogynia class. The flowers are aggregate and monopetalous; the stigma is bifid; and the drupae are aggregate. There are three species, none of them natives of Britain.

MORINELLUS, in ornithology. See Charadrius.

MORINELLUS, in ornithology. See Charadrius.

MOROCHO, or Moresco, a port-town of France, in the province of Britany: W. long. 40°, N. lat. 47° 37'.

MOROCHTHUS, in natural history, an indurated clay, called by us French chalk; serving tailors and others.
MOS (310) MOS

The method of performing Mosaic-work of glafs is this:

They provide little pieces of glafs, of as many different colours and sizes as possible.

Now, in order to apply these several pieces, and out of them to form a picture, they in the first place procure a cartoon or design to be drawn; this is transferred to the ground or plaster by calking, as in painting in fresco. See Fresco.

As this plaster is to be laid thick on the wall, and therefore will continue fresh and soft a considerable time, so that there may be enough prepared at once, to serve for as much work as will take up three or four days.

This plaster is composed of lime, made of hard stone, with brick dust very fine, gum tragacanth, and whites of eggs: when this plaster has been thus prepared and laid on the wall, and made the design of what is to be represented, they take out the little pieces of glafs with a pair of pliers, and range them one after another, still keeping strictly to the light, shadow, different tints and colours represented in the design before; pressing or flattening them down with a ruler, which serves both to sink them within the ground, and to render the surface even.

Thus in a long time, and with a great deal of labour, they finish the work, which is still the more beautiful, as the pieces of glafs are more uniform, and ranged at an even height.

Some of these pieces of mosaic-work are performed with that exactness, that they appear as smooth as a table of marble, and as finished and mafterly as a painting in fresco; with this advantage, that they have a fine lustre, and will last ages.

The finest works of this kind that have remained till our time, and those by whom the moderns have retrieved the art, which was in a manner lost, are those in the church of St Agnes, formerly the temple of Bacchus at Rome; and some at Pisa, Florence, and other cities of Italy. The most esteemed among the works of the moderns are those of Joseph Pine, and the chevalier Lanfranc in the church of St Peter at Rome: these also are very good ones at Venice.

Method of performing Mosaic-work of marble and precious stones is this: The ground of mosaic-works, wholly marble, is usually a malleable marble, either white or black. On this ground the design is cut with a chisel, after it has been sifted calked. After it has been cut out of a considerable depth, i.e. an inch or more, the cavities are filled up with marble of a proper colour, sift furnished according to the design, and reduced to the thickness of the indentures with various instruments. To make the pieces thus fitted into the indentures cleave fast, whose several colours are to imitate those of the design, they use a stucco, composed of lime and marble-duft; or a kind of maltie, which is prepared by each workman, after a different manner peculiar to himself.

The figures being marked out, the painter or sculp- tor himself draws with a pencil the colours of the figures, not determined by the ground, and in the same manner makes strokes or hatchings in the place, with
Manner of performing MOSAIC WORK of gypsum. Of the

MOSAMBIQUE, the capital of a province of the same
corner in Zanguebar, in Africa, situated on an island
deep stone. If it be of plaster of Paris, they spread it
in a wooden frame, of the length and breadth of the
work intended, and in thicknesses about an inch and a
half. This frame is so contrived, that the tenons be-
ing only joined to the mortises by single pins, they
may be taken afunder, and the frame be dismounted,
when the plaster is dry. The frame is covered on one
side with a strong linen cloth, nailed all round, which
being placed horizontally with the linen at the bottom,
is filled with plaster sifted through a wide sieve.
When the plaster is half dry, the frame is set up per-
pendicularly, and left till it is quite dry; then it is
taken out, by taking the frame to pieces.

In this mosaic, the ground is the most important part.
Now in order to the preparation of this sifted gypsum,
which is to be applied on this ground, it is dissolved
and boiled in the best English glue, and mixed with
the colour that it is to be of; then the whole is work-
ed up together into the usual consistence of plaster,
and then is taken and spread on the ground five or six
inches thick. If the work be such, as that mouldings
are required, they are formed with gougues and other
instruments.

It is on this plaster, thus coloured like marble or
precious stone, and which is to serve as a ground to a
work, either of lapis, agate, alabaster, or the like,
that the design to be represented is drawn; having been
first pounded or calculated. To hollow or imprest the
design, they use the fame instruments that sculptors
do; the ground whereon they are to work not being
much less hard than the marble itself. The cavities
being thus made in the ground, are filled with the fame
gypsum boiled in glue, only differently coloured, and
thus are the different colours of the original repre-

tented. In order that the necessary colours and teints
may be ready at hand, the quantities of the gypsum
are tempered with the several colours in pots.

After the design has been thus filled and rendered
visible, by half-polishing it with brick and soft stone,
they go over it again, cutting such plates as are either
to be weaker or more faded, and filling them with
gypsum; which work they repeat, till all the colours
being added one after the other, represent the origi-
nal to the life.

When the work is finished, they scour it with soft
stone, sand, and water; after that, with a pumice-
stone; and in the last place polish it with a wooden
mallet and emery. Then, lastly, they give it a lu-
flre, by smearing it over with oil, and rubbing it a
long time with the palm of the hand, which gives it
a luflre no ways inferior to that of natural marble.

MOSAMBIQUE, the capital of a province of the same
name in Zanguebar, in Africa, situated on an island
at the mouth of the river Mosambique: E. lon. 42°.
S. lat. 15°.

MOSCHUS, a genus of quadrupeds of the order of pe-
cora, having no horns; the canine teeth of the upper
jaw are exerted. There are three species, viz. 1. The
moschiferus, or muck animal, has a bag or pellicle near
the navel, in which the perfume called muck is contained.

This
This creature, when full grown, is three feet in length, from the tip of the nose to the rump; the head is oblong, and the anterior part much like the greyhound; the ears are large and erect, they resemble those of the rabbit, and are equal in length to the diameter of the forehead; the tail is not more than two inches in length, and the creature always carries it erect; the body is tolerably flabby, and rounded; the legs about a foot in length, and very robust; the feet deeply divided, each into two claws in the anterior part, and as many heels behind. The fur on the head and that on the legs is about half an inch long, that on the belly is an inch and a half, and that which grows on the back three inches; these hairs are thicker than in any other known animal, and are variegated, from the base to the extremity, with distinct patches of brown and white. The vessel or bag in which the perfume is contained, is three inches long and two broad, and hangs under the belly, protuberating near three quarters of an inch beyond the surface. It is a native of Tartary.—2. The grimmia has a protuberant belt upon its head, and is found in Africa. 3. The pygmaeus has feet narrower than a man's finger. It is found in Asia and Guinea.

MOSCOW, the capital of the province of the same name in Muscovy, situated on the river Moscowa, 360 miles south-east of Peterburg: E. long. 38°, N. lat. 55° 45'.

MOSCUWA, a river which rises in the west part of the province of Moscow, and falls into the river Ocka at Kolomna.

MOSELLE, a river of Germany, which rises in the mountains of Vauge, in Lorrain, and, running through the Rhine at Coblentz.

MOSKITO, a country of North America, situated between 85° and 88° of west longitude, and between 13° and 15° of north latitude; having the north sea on the north and east, Nicaragua on the south, and Honduras on the west.

MOSBURG, or MOSTBURG, a town of Germany, in the circle of Bavaria, situated at the confluence of the rivers Iler and Amburg, thirty miles north-east of Munich.

MOUSE, a temple, or place of religious worship, among the Mahometans.

All mosques are square buildings, generally built with stone. Before the chief gate there is a square court, paved with white marble; and low galleries round it, whose roof is supported by marble pillars. In these galleries the Turks wash themselves before they go into the mosque. In each mosque there is a great number of lamps; and between these hang many crystal rings, oilriches eggs, and other curiosities, which when the lamps are lighted make a fine show. As it is not lawful to enter the mosques with shoes or stockings on, the pavements are covered with pieces of fluffed together, each being wide enough to hold a row of men kneeling, sitting, or prostrate. The women are not allowed to enter the mosque, but stay in the porches without. About every mosque there are six high towers, called minarets, each of which has three little open galleries, one above another; these towers, as well as the mosques, are covered with lead, and adorned with gilding and other ornaments; and from thence, instead of a bell, the people are called to prayers by certain officers appointed for that purpose. Most of the mosques have a kind of hospital belonging to them, in which travellers, of what religion soever, are entertained during three days. Each mosque has also a place called Tarbe, which is the burying-place of its founders; within which is a tomb six or seven feet long, covered with green velvet or satin; at the ends of which are two tapers, and round it several seats for those who read the koran and pray for the souls of the deceased.

MOSS, in botany. See Muscus.

Moss is also a name given to boggy grounds in many parts of the kingdom. These consist of a turfy surface, below which is a black, moist, spongy earth, which being dug up with spades somewhat in the form of bricks, and dried, is what they call peats, used as fuel in several parts; and the upper part, being cut and dried, makes turfs, another coarser sort of fuel.

MOSTRA, in the Italian music, a mark at the end of a line or space, to show that the first note of the next line is in that place; and if this note be accompanied with a sharp or flat, it is proper to place these characters along with the montra.

MOTACILLA, in ornithology, a genus of birds, of the order of the pafferes, distinguished by a straight beak, of a tubulated figure, and a lacerated tongue. There are 49 species belonging to this genus, most of which feed upon insects, and migrate from the north to the southern countries in order to procure subsistence in winter.

MOTHE, in law-books, signifies court or convention; as a ward-mote, burg-mote, swain-mote, &c.

MOTH, in zoology. See PHALENA.

MOTHER, a term of relation, denoting a woman who hath born a child.

MOTION is defined to be the continued and successive change of place. See Mechanics.

MOTTO, in armoury, a short sentence or phrase, and sometimes containing whatever pleases the fancy of the deviser.

MOVEABLE, in general, denotes any thing capable of being moved.

MOVEABLE Subject, in Scots law, any thing that moves itself, or can be moved; in contradistinction to immoveable or heritable subjects, as lands, houses, &c.

MOVEMENT, in mechanics, a machine that is moved by clock-work. See Watch.

Perpetual Movement. Some have attempted to find a perpetual movement, but without success; and there is reason to think, from the principles of mechanics, that such a movement is impossible: for though in many cases of bodies acting upon one another, there is a
Mount St Michael, a borough-town of Cornwall,

Mount, an elevation of earth, called also mountain.

Mount Sorrel, a market-town of Leicestershire, seven miles north of Leiceter.

Mount of Piety, certain funds or establishments in Italy, where money is lent out, on some small security. We had also mounts of piety in England, raised by contribution for the benefit of people ruined by the extortions of the Jews.

Mount, in heraldry, a ball or globe with a cross upon it, otherwise the movement will not be perpetual; so that any action by which the absolute quantity of force is increased, of which there are several forts, must have its corresponding counter-action, by which the gain of force is destroyed, and the quantity of force restored to its first state.

Thus, by these actions, there will never be any gain of direct force, to overcome the friction and the resistances of the medium; so that every motion being diminished by these resistances, they must at length languish and cease.

Mount, in agriculture, a loose kind of earth, everywhere where obvious on the surface of the ground, called also natural or mother earth; by some also loam.

Mountains, a part of the earth, rising to a considerable height above the level of the surface thereof.

Mouse-tail. See Myosurus.

Mouse, in zoology. See Mus.

Moulinet is also a kind of turnstile, or wooden cross, used in mechanics, to signify a roller, by which the gain of motion is destroyed, and the quantity of force restored to its first state.

Thus, by these actions, there will never be any gain of direct force, to overcome the friction and the resistances of the medium; so that every motion being diminished by these resistances, they must at length languish and cease.

Mould, in agriculture, a loose kind of earth, everywhere where obvious on the surface of the ground, called also natural or mother earth; by some also loam.

Mouldiness, a term applied to bodies which contain moisture, where it is evident that the quantity of force is increased, of which there are several forts, must have its corresponding counter-action, by which the gain of force is destroyed, and the quantity of force restored to its first state.

Mould, or Mould, in the mechanic arts, &c. a cavity cut with a design to give its form or impression to some softer matter applied therein, of great use in sculpture, foundry, &c.

Mould, in agriculture, a loose kind of earth, everywhere where obvious on the surface of the ground, called also natural or mother earth; by some also loam.

Mouldings, in architecture, projectures beyond the naked wall, column, wainscot, &c. the assemblage of which forms cornices, door-cases, and other decorations of architecture. See Architecture.

Moulinet is used in mechanics, to signify a roller, which being crossed with two levers, is usually applied to cranes, capstans, and other sorts of engines of the like nature, to draw ropes, and heave up stones, &c.

Moulinet is also a kind of turnstile, or wooden cross, which turns horizontally upon a flake fixed in the ground; usually placed in passages to keep out horses, and to oblige passengers to go and come one by one. These moulinets are often set near the outworks of fortified places at the sides of the barriers; through which people pass on foot.

Mould, a term used for a bank or rampart, or other fence, particularly that of earth.

Mound, in heraldry, a ball or globe with a cross upon it, such as our kings are usually drawn with, holding it in their left hand, as they do the sceptre in the right.

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MULE, in zoology, a mongrel kind of quadruped, usu-
ally generated between an as and a mare, and some-
times between a horse and a she-as.

MULLERAS, a town of Germany, in the circle of
Upper Saxony, and marquisate of Brandenburg, sit-
tated thirty-eight miles south-east of Berlin.

MULLET, in ichthyology. See Mugil.

MULLETT, or MULLET, in heraldry, a bearing in form
of a flat, or rather of the rowel of a spur, which it o-
riginally represented.

MULSOM, a liquor made of wine and honey, or even
of wine and water.

MULTAN, or MOUTAN, a city of hither India in Asia,
capital of the province of Multan, situated on the river
Indus. E. long. 72° 15'; N. lat. 30°.

MULTIPLE, in arithmetic, a number which compre-
hends some other several times, thus 6 is a multiple of
2, and 12 is a multiple of 6, 4, and 3, comprehending
the first twice, the second thrice, &c.

ACTION of MULTIPLYING, in Scots law. See
Law, Tit. xxx. 24.

MULTIPLICAND, in arithmetic. See Arithmetic,
p. 371.

MULTIPLICATION, in general, the act of increas-
ing the number of any thing.

Multiplication in arithmetic, is a rule by which any
given number may be speedily increased, according to
any proposed number of times. See Arithmetic,
p. 371.

MULTIPLICATION, in algebra. See Algebra, p.
81.

MULTIPLICATOR, or Multiplier, in arithmetic.
See Arithmetic, p. 371.

MULTIPLYING GLASS, in optics, one wherein objects
appear increased in number. See Optics.

MULTURE, in Scots law, the quantity of grain paid
to the proprietor or tacksman of a mill for grinding.
See Law, Tit. xvi. 12.

MULVIA, a river of Barbary, in Africa, which rises in
the mountains of Atlas, and divides the empire of Mo-
rocco from the kingdom of Algiers, and then falls in-
to the Mediterranean, west of Marfalquivier.

MUM, a kind of malt-liquor, much drank in Germany;
and chiefly brought from Brunswick, which is the place
of most note for making it. The process of brew-
ing mum, as recorded in the town-house of that city,
is as follows: Take sixty-three gallons of water that
has been boiled till one third part is consumed, and
brew it with seven bushels of wheaten malt, one bushel
of oat-meal, and one bushel of ground beans; when it
is tinned, the hoghead must not be filled too full at
first: as soon as it begins to work, put into it three pounds
of the inner rind of fir, one pound of the tops of fir
and beech, three handfuls of card, us benedictus, a
handful or two of the flower of rofa folis; add burnet,
betony,
bony, marjoram, avens, pennyroyal, and wild thyme,
of each a handful and a half; of elder flowers, two
handfuls or more; seeds of cardamum bruised, thirty
ounces; barberries bruised, one ounce; when the li-
quor has worked a while, put the herbs and seeds into
the vessel; and, after they are added, let it work over
as little as possible; then fill it up: lastly, when it is
stopped, put into the hoghead ten newly laid eggs un-
broken; stop it up close, and drink it at two years end.
Our English brewers, instead of the inner rind of fir,
ufc cardamum, ginger, and cassiafras; and also add ele-
campane, muskder, and red sanders. Mum, on being
imported, pays for every barrel 1 l. 5s.

MUMMY, a body embalmed or dried, in the manner
used by the ancient Egyptians; or the composition with
which it is embalmed. There are two kinds of bodies
denominated mummies: the first are only carcasses
dried by the heat of the sun, and by that means kept
from putrefaction: These are frequently found in the
fands of Lybia. Some imagine, that these are the
bodies of deceased people buried there on purpose
to keep them entire without embalming; others think
they are the carcasses of travellers, who have been over-whelmed
by the clouds of sand raised by the hurricanes fre-
fquent in thofe deserts. The second kind of mummies
are bodies taken out of the catacombs near Cairo, in
which the Egyptians deposited their dead after embalm-
ing.

We have two different substances preferred for me-
dicine under the name of mummy, though both in
some degree of the same origin. The one is the
dried and preferred flefh of human bodies, embalmed
with myrrh and spices; the other is the liquor running
from such mummies, when newly prepared, or when
affected by great heat or damp. The latter is some-
times in a liquid, sometimes of a solid form, as it is
preferred in vials well stopped, or suffered to dry and
harden in the air. The first kind of mummy is brought
to us in large pieces, of a lax and friable texture, light
and spungy, of a blackish brown colour, and often
damp and clammy on the surface: it is of a strong but
difagreeable smell. The second kind of mummy, in its
liquid state, is a thick, opaque, and viscous fluid, of a
blackish colour, but not disagreeable smell. In its indu-
rated state, it is a dry solid substance, of a fine fheining
black colour, and close texture, easily broken, and of
a good smell; very inflammable, and yielding a fcent
of myrrh and aromatic ingredients while burning.
This, if we cannot be content without medicines from
our own bodies, ought to be the mummy used in the
shops; but it is very scarce and dear; while the other
is fo cheap, that it will always be moft in ufe.

All these kinds of mummy are brought from Egypt.
But we are not to imagine, that any body breaks up
the real Egyptian mummies, to sell them in pieces to
the druggists, as they may make a much better market
of them in Europe whole, when they can contrive to
get them. What our druggists are supplied with, is
the flesh of executed criminals, or of any other bodies
the Jews can get, who fill them with the common bitu-
men so plentiful in that part of the world; and adding

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a little aloes, and two
send them to be baked in
exhaled, and the embalming thus
thoroughly that the flefh will keep and bear transport-
ing into Europe. Mummy has been esteemed resinous
and balsamic: but whatever virtues have been attribu-
ted to it, seem to be fuch as depend more upon the in-
gredients used in preparing the flefh, than in the flefh
itself; and it would furely be better to give thofe in-
gredients without fo shocking an addition.

MUMMY, among gardeners, a kind of wax used in graft-
ing and planting the roots of trees, made in the follow-
ing manner: Take one pound of black pitch, and a
quarter of a pound of turpentine; put them together
into an earthen pot, and let them on fire in the open
air, holding something in your hand to cover and
quench the mixture in time, which is to be alternately
lighted and quenched till all the nitrous and volatile
parts be evaporated. To this a little common wax is
to be added; and the composition is then to be set by
for ufe.

MUNGATS, or MUNKATS, a town of upper Hungary:
E. long. 22°, N. lat. 49° 36'.

MUNICH, a large and elegant city, the capital of the
electorate and duchy of Bavaria situated on the river
Ifer: E. long. 11° 23', N. lat. 48° 5'.

MUNICIPAL, in the Roman civil law, an epithet which
signifies invested with the rights and privileges of Roman
citizens. Thus the municipal cities were thofe whole
inhabitants were capable of enjoying civil offices in the
city of Rome: These cities, however, according to
Mariana, had fewer privileges than the colonies: They
had no suffrages or votes at Rome; but were left to
be governed by their own laws and magiftrates. Some
few municipal cities, however, obtained the liberty of
votes.

Municipal, among us, is applied to the laws that
obtain in any particular city or province. And thofe
are called municipal officers who are elected to defend
the interest of cities, to maintain their rights and pri-
ileges, and to preferve order and harmony among the
citizens; fuch as mayors, sheriffs, confuls, &c.

MUNITION, the provisions with which a place is fur-
fified in order for defence; or that which follows a
camp for its subsiftence.

MUNSTER, the capital of the bilhoprick of the fame
name, and of the circle of Westphalia, situated on the
river Aa: E. long. 7° 10', N. lat. 52° 53'.

MUNSTER, is also a town of Germany, in the Landgra-
viate of Alftia, subject to France: E. long. 7° 5',
N. lat. 48° 8'.

MUNSTER MEINFELT, a town of Germany, in the circle
of the lower Rhine, and electorate of Triers: E. long.
7°, N. lat. 50° 15'.

MUNSTERBERG, the capital of the duchy of the fame
name in Silefia: E. long. 16°, N. lat. 56° 35'.

MUNTINGIA, in botany, a genus of the polyandria
claf*. The calix confifts of five fegmenis,
and the corolla of five petals; and the berry has one
several segments; barberries bruised, one ounce; and also add ele-
campane, muskder, and red sanders. Mum, on being
imported, pays for every barrel 1 l. 5s.

MUNSTER, is also a town of Germany, in the Landgra-
viate of Alftia, subject to France: E. long. 7° 5',
N. lat. 48° 8'.

MUNSTER MEINFELT, a town of Germany, in the circle
of the lower Rhine, and electorate of Triers: E. long.
7°, N. lat. 50° 15'.

MUNSTERBERG, the capital of the duchy of the same
name in Silesia: E. long. 16°, N. lat. 56° 35'.

MUNTINGIA, in botany, a genus of the polyandria
claf*. The calix consists of five segments, and the corolla of five petals; and the berry has one
seed containing many seeds. There is but one species,
a native of America.

MURÆNA,
MURCIA, the capital of the province of the same name in Spain: W. long. 1° 12', N. lat. 38° 6'.

MURDER, or MURDERER, in law, is the wilful and felonious killing a person from premeditated malice; provided the party wounded, or otherwise hurt, die within a year and a day after the fact was committed. See Law, Tit. xxxiii.

MURDERERS, or MURDERING-Pieces, in a ship, are small pieces of ordnance, either of brass or iron, which have chambers, put in at their breeches. They are used at the bulk-heads of the fore-castle, half-deck, or steerage, in order to clear the deck, on the ship's being boarded by an enemy.

MURENGERS, two officers of great antiquity in the city of Chester, annually chosen out of the aldermen, to see that the walls are kept in repair, and to receive a certain toll and custom for the maintenance thereof.

MUREX, in zoology, a genus of shells belonging to the order of vermes testacea. This animal is of the snail kind; the shell consists of one spiral valve, rough with membranaceous furrows; and the aperture terminates in an entire canal either straight or somewhat ascending.

MURY, in heraldry, a kind of purple colour. See Salt.

MUS, in zoology, a genus of quadrupeds, belonging to the order of grises; the generic character of which is, that the fore-teeth of the lower jaws are faturated. There are 21 species. 1. The porcellus, or guiney-pig, has no tail; there are four toes on the fore-feet, and three on the hind ones. This animal makes a grunting noise, is very refrail, and flamps with its hind-feet when teased. It loves heat, and feeds upon vegetables. The female has two dugs. The colour is very various. It is a native of Brazil. 2. The aguti has a short tail, four toes on the fore-feet, three on the hind ones, and a yellowish belly. It is a native of Brazil, Surinam, and Guinea. 3. The leporinus has the same characters with the former, only the belly is white. It is found in Java and Sumatra. 4. The citellus has a short tail, an ash-coloured body, and no ears. It is found in Bohemia, &c. below ground. 5. The lemmus, has a short tail, five toes on both fore and hind-feet, and the body is variegated with green and yellow. They are found in the Lapland mountains under little hillocks, and feed solely on vegetables. 6. The paca, has a short tail, five toes on each foot, and there are three yellowish lines on each side. It is a native of Brazil. 7. The marmota has a short hairy tail, round ears, and gibbous cheeks. It digs deep holes in the earth with amazing quickness; sleeps profoundly during the winter; lifts its food to its mouth with the fore-feet; often sits erect; it is easily tamed, and is found in Switzerland. 8. The monax has a hairy tail, an ash-coloured body, roundish ears, and four toes on the fore feet and five on the hind ones. It is a native of America. 9. The cricetus has a tail of a moderate length, round ears, a black belly, and reddish sides, with three white spots. This animal digs deep caverns in the earth, divided into many different cells in which it deposits and prefers large quantities of fruits and grains. The female brings forth six young ones twice in the year, each of which lives in a separate cell. They are hunted for food, for their skins, and even for the quantity of grain found in their cells. It is a native of Germany. 10. The terrestris has a hairy tail, with four toes on the fore-feet, and five on the hind ones, and ears shorter than the hair. This animal, which is about half the size of a rat, digs in the gardens like a mole, and eats the bark off the roots of trees, &c. It swims in ditches, and devours young ducks in the ponds. It is a native of Europe. 11. The amphibious has a long hairy tail, with palmed feet. It digs in the banks of ditches and under the roots of trees, and feeds upon vegetables. It is found both in Europe and Africa. 12. The rattus, or rat, has a long naked tail, four toes on the fore-feet, and five on the hind ones, and a claw on the large toe. This animal infests the houres every where through Europe, and is devoured by cats and other animals of the same class. It is reported by several authors, that rats were originally transported from America in a ship belonging to Antwerp. 13. The muculus, or common mouse, has a long naked tail, four toes on the fore-feet and five on the hind ones, but has no claw on the large toe. This animal is a native of Europe, feeds upon grain and flesh of all kinds. 14. The avellanarius has a long hairy tail, a reddish body, a white throat, and the hind toes have no claws. It frequents the woods of Europe, feeds upon nuts, which it lays up in the earth, and sleeps during winter. 15. The querimus has a long hairy tail, with a black ring under the eyes. It is a native of the south of Europe. 16. The gregarius has a tail about one third of the length of its body, and somewhat hairy; the body is of a greyish colour, and the legs are white. It
It is a native of Germany. 17. The Sylvaticus has a tail of a middling length, four toes on the fore feet, and five on the hind ones; the body is grey, intermixed with black hairs, and the belly is white. It is found in the gardens and woods of Europe. 18. The friatus has four toes on the fore-feet, and five on the hind ones; it has longitudinal streaks on the body, with white spots. It is a native of India. 19. The longipes has a long covered tail, four toes on the fore feet, five on the hind ones, and very long thighs. It is found in the torrid zone. 20. The Jaculus has a long feecy tail, with very long thighs, and short fore-legs. It walks on its hind-feet only, and has a jumping motion. It is found in Arabia, Egypt, &c. 21. The Volans has a long hairy tail, four toes on the fore feet and five on the hind ones, and the skin from the ears to the tail is extended like wings, by which it is enabled to fly. It is native of Virginia and Mexico.

Musca, the plantain-tree, in botany, a genus of the polygama monzae claps. The calyx is a spathe; the corolla consists of two petals; one of them straight and teethed; and the other is concave, short, and furnished with a nectarium. It has fix filaments, and one stigmas. There are four species, all natives of the Indies.

Muscadinct, a rich kind of wine, of the growth of Provence and Languedoc, in France.

Muscle, in anatomy. See Anatomy, p. 192.

Muscle, in natural history. See Mytulus.

Museum, a name which originally signified a part of the palace of Alexandria, which took up at least one fourth of that city. This quarter was called the Museum, from its being set apart for the musees and the study of the sciences. Here were lodged and entered the men of learning who were divided into many companies or colleges, according to the sciences of which they were the profesfors; and to each of these houses or colleges was allotted a handsome revenue. The foundation of this establishment is attributed to Ptolemy Philadelpbus, who here placed his library. Hence the word Museum is now applied to any place set apart as a repository for things that have an immediate relation to the arts.

The Museum at Oxford, called the Ashmolean Museum, is a noble pile of building, erected at the expense of the university, at the west end of the theatre, at which side it has a magnificent portal, sultained by pillars of the Corinthian order. The front, which is to the street, extends about sixty feet, where there is this inscription over the entrance, in gilt characters, Museum Ashmoleanum, schola naturales historie, officina eunica.

It was begun in 1679, and finished in 1683, when a valuable collection of curiosities was presented to the university by Elias Ashmole, Esq. which were the same day reposited there. And several accessions have been since made to the Museum; among which are hieoglyphics and other Egyptian antiquities, an entire mummy, Roman antiquities, alars, medals, lamps, &c. and a variety of natural curiosities.

The British Museum in London is a large, beautiful, and magnificent building, and the noblest cabinet of curiosities in the world. This edifice was erected in 1677, and was called Montague-house, from having been the town residence of the dukes of Montague. In the year 1753, the British parliament having passed an act for purchasing the Museum of the late Sir Hans Sloan, and the collection of manuscripts of the late lord Oxford, called the Harleian Library, for the use of the public; 26 trustees were appointed and incorporated, to provide a repository for those and some other collections, which repository was to be called the British Museum. These trustees elected fifteen other trustees; and having bought Montague-house, fitted it up for the reception of these collections: they also appointed officers to superintend the museum; and having ordained certain statutes with respect to viewing the collection contained in it, the public were admitted to view it in 1757.

Muses, certain fabulous divinities among the pagans, supposed to preside over the arts and sciences; for this reason it is usual for the poets, at the beginning of a poem, to invoke these goddesses to their aid. Some reckon the muses to be no more than three, viz. Mneme, Aede, and Melete; that is, memory, singing, and meditation; but the most ancient authors, and particularly Homer and Hesiod, reckon nine; viz. Clio, which means glory; Euterpe, pleasuring; Thalia, flourishing; Melpomene, attracting; Terpsichore, rejoicing the heart; Erato, the amiable; Polyhymnia, a multitude of songs; Urania, the heavenly; and Calliope, sweetness of voice. To Clio, they attributed the invention of history; to Melpomene, tragedy; to Thalia, comedy; to Euterpe, the use of the flute; to Terpsichore, the harp; and to Erato, the lyre and lute; to Calliope, heroic verse; to Urania, astrology; and to Polyhymnia, rhetoric.

Mushroom, in botany. See Fungus.
disposing and conducting sounds considered as acute and grave; and proportioning them among themselves, and separating them by just intervals pleasing to the sense.

Mr Malcom defines it a science that teaches how found, under certain measures of time and tune, may be produced; and so ordered and disposed, as either in consonance (i.e. joint-sounding) or succession, or both, they may raise agreeable sensations.

From this definition, the science naturally divides into two general parts, viz. theoretical and practical.

PART I. THE THEORY OF MUSICK.

AXIOM I. The ear is the sole judge of sound. Every sound is not a musical sound. For to this two things are required: first, That the sound please the ear; secondly, That it be within a certain compass. A musical sound is clear, uninterrupted, and uniform; and ought not to exceed the power of the ear to judge of it.

For sounds, very deep or very high, are not easily distinguished, but by an ear very conversant in music.

Sound being a simple idea, cannot be defined but by an imperfect description of its cause; which is a voluntary motion of the air, communicated by the vibration of the parts of bodies to the organ of hearing.

The diversities of sounds, and their proportions, are perfectly discerned by the ear, are the object of the theory of music, the grounds and principles of the practice, as well as the causes of pleasure in the sense and imagination.

These diversities of sounds are expressed by the terms high and low, acute and grave, or sharp and flat. Hence, from any given sound, we can conceive a succession of them; wherein the last in order is more acute than the former; and this series is called notes ascending.

Or, on the contrary, when, in a succession of sounds, the last in order is more grave than the former; this series is called notes descending.

AXIOM II. From this order of notes ascending and descending are deduced all the proportions which constitute harmony; and upon which the whole superstructure of music is raised.

First, of the intervals of sounds lying in their natural order. Of these there are seven intervals, named from the first seven letters of the alphabet, viz. A, B, C, D, E, F, G.

The distance between any two of these, whether immediate or remote, is called an interval. And every interval is named from the natural numbers; beginning at unity.

In naming an interval, it is always understood of the ascending notes; and both terms are inclusive. Thus AB is called a 2d, AE a 5th, BE a 4th, EG a 3d, AA an 8th or octave; and so of the rest.

We proceed now to lay down an exact description of all the intervals in music. For from the knowledge of these are discovered all the proportions which constitute harmony; and upon which the whole superstructure of music is raised.

First, of the intervals of sounds lying in their natural order. Of these there are seven intervals, named either the greater tone, the lesser tone, and the half-tone or semitone. See the Music Plates, No. 1, 2.

In this series of 8 notes are contained 5 whole tones; three greater, and two lesser; and 2 semitones. Reducing them therefore to the lowest denomination, they will be found to contain 12 half-tones; and inclusively 13. Every octave then contains 13 half tones; out of the various combinations of which arise the several concords and discords, as will be shewn in its proper place. The lesser tones are alike divided into half tones, as are the greater. We shall therefore, for brevity sake, hereafter use the distinction only of whole tones and half tones: the reason for which shall be assigned below.

From the inequality in the order of these intervals we draw the following corollary.
Cor. II. Harmonical proportion is of a species different from all other proportions, and can be demonstrated only from principles peculiar to itself. This will be seen when we come to shew the method of dividing a line harmonically; as well as from the proportion stated in numbers.

The first of the notes in the examples above is called the key-note, or key. Notwithstanding the intervals may be reckoned from any given note; yet it will answer our purpose better to begin with the key.

In the first example,

The first interval, or distance between the key and second, contains 2
Between the 2d and 3d 2
3d and 4th 1
4th and 5th 2
5th and 6th 2
6th and 7th 2
7th and 8th 2

In the second example,

The first interval, or distance between the key and second, contains 2 semitones.
Between the 2d and 3d 1
3d and 4th 2
4th and 5th 2
5th and 6th 1
6th and 7th 2
7th and 8th 2

From this comparison of the two series, it is evident there is but one difference, and this arising from the order of the notes, or place of the semitone. For if you begin to read the second series at the interval between the 3d and 4th, the semitones will be found exactly in the same order as in the first example.

In the first example, the first semitone falls on the 4th note, or that which is next above the 3d to the key; which 3d is 5 half-tones above the key inclusively. In the 2d example, the half-tone falls on the 3d note; and is therefore itself the third to the key, and is four half-tones above the key inclusively.

This distinction of the place of the semitone is most worthy of observation; it being the only essential difference of tune, the ground work of all that beautiful variety which may be introduced in the air or melody, as well as it is the principle or hinge on which turns the resolution of every discord. The key-note of every tune is that wherein the tune ends; though it may be altered for variety in the upper part, yet the last note of the bass is ever the key.

When the 3d to the key is 5 semitones to the key, as in the first example, that tune is said to be composed in a sharp key. When the 3d to the key is 4 semitones to the key, as in the second example, the tune is in a flat key. And this, as was said before, is the only difference in tune.

This distinction of flat and sharp third holds good, not only in relation to the key, but likewise to every note in the scale of music. And in this light it is the foundation of composing in different keys; of changing the key in the same tune which introduces the so much desired variety in music; and of writing the same tune in divers keys, which is called transposition. Hence we establish the following axioms.

Axiom III. As the difference of the flat and sharp third to the key constitutes the key, and is essential to the tune: so no tune composed in a sharp key can be composed into a flat one, nor a flat into a sharp; for that would be altering the permanent nature of things.

The truth of this axiom will most evidently appear, when we shall, in the second part, or practice, have learned the art of transposition.

Axiom IV. The great and constant object which must be sought after in music, whether in composition, or performance of thorough bass, is variety with uniformity. For the proportions already laid down, and the prodigious variety emerging from them, as they lie in the order of nature, before they are modified, divided or combined by art, do not only point out this variety to us; but the concords and discords likewise made out of these, and arranged by art, will not only not suffer us to recede from the established precept, but by a kind of sweet violence constrain us to pursue this darling object.

On the truth of this axiom is grounded the reason for the mixture of discord with harmony, and the occasion of this precept in playing thorough bass, namely, that the hands should as much as possible move in a contrary direction.

As to the place of the other semitone, which in the flat key is on the 6th, the reason shall be told in its proper place. And moreover, it must be observed, that the greater 7th in the sharp key, which causes the second semitone to fall on the 8th in that key, is also common to the flat key in many passages, but unexceptionably at the end of the tune, or close.

Sect. 3. Of the Concord and Discord.

Of the intervals standing in their natural order are compounded the greater intervals, namely, the concords and discords.

These are the next things to be considered. Now, to investigate the order of these, and their proportions to each other, we must have recourse to the original cause of sound; that is, to the tremulous motion of the air, excited by the percussion of some solid body, as a bell, string, or pipe.

This trembling of the air is in proportion quick or slow as the impression given it by the voice or instrument. The quicker the trembling is, the more acute the sound; the slower, the more grave or flat. The same sound is produced from all solid bodies, by exciting the same degree of quickness of the air, excited by the percussion of the same solid body, as a bell, string, or pipe.

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proportional to the lengths. Thus in two firings of the same matter, and equal diameters; if one be double the length of the other, it will give half the quickness of pulses; that is, half the number of pulses in the same time: or, the lengths being as 2 to 1, the vibrations are as 1 to 2. On this axiom are demonstrated the order and proportions of the concords, as follows.

**Proportion of the Octave.**

Let AB, a musical firing, be divided equally in C, and stop there: CB will found an octave to the whole or open firing AB. Now, CB, AB, are as 1 to 2; therefore, the vibrations are as 2 to 1; that is, the proportion of the octave or diapason is double, or 2 to 1.

**Proportion of the 5th.**

Let AB be divided into three equal parts, and stop in C: CB will found a 5th to the whole or open firing. Now, CB is to AB as 2 to 3; therefore the vibrations are as 3 to 2; that is, the proportion of the 5th, or diapente, is sesquialteral, or 3 to 2.

**Proportion of the sharp 3d.**

Stop the firing in C, the 5th part: CB will found a greater 3d to AB. But CB is to AB as 4 to 5. Therefore the vibrations are as 5 to 4; or, the proportion of the sharp 3d is as 5 to 4.

**Proportion of the flat 3d.**

Stop in C the 6th part: CB will found the lesser or flat third. But, &c. Therefore the proportion of the flat third is as 6 to 5.

**Proportion of the greater or sharp 6th.**

CB 4ths of AB will found the greater 6th. Therefore the proportion of the sharp 6th, is as 5 to 3.
The 3ds and 6ths imperfect concords. The 4th, of a practice.

Example of two concording with the open string or bass. No 4.

Next follows an example of three concording with the bass. No 5.

Having thus discovered the concords, their order and proportions; it is worth remarking, that the first concord, or 3d, which arises from the most simple division of a line, is the most perfect concord; the 5th is the next perfect concord; and so of the rest, in the order they have been found by the division of the string. For the nature and perfection of the 4th, accounted by some a very imperfect concord, shall be explained in the corollaries of the demonstration of the harmony, in Part II. on practice.

The 8ths and 9ths then are called the perfect concords.

The 3d and 6ths imperfect concords. The 4th, of a middle nature between the others, may be called an improper concord; for this reason, that with the 6th, with which it is always accompanied in harmony, though it make perfect harmony with the given note, yet they change the chord into that of the 4th to that note.

Likewise the 6th, whether joined with the 3d or 4th to the given note, tho' it make perfect harmony with either, yet they change the chord into that of the 6th or 4th to the same note.

Hence the reason why the 6ths are more imperfect concords than the 3ds.

From the order and perfection of the concords thus discovered; we deduce the following corollary.

Cor. III. The most perfect harmony is that which will be produced by the perfect concords, namely, the 3d, 5th, and 8th. Thus No. 6.

From the foregoing corollary, we are able to give a just definition of harmony. Harmony consists in one certain invariable proportion of distance of four founds performed at the same instant of time, and most pleasing to the ear.

These proportions of the first series are called simple concords. If the notes of a second series be added to the first octave, the proportion of any two concording notes compounded with the octave retains the same and nature of the simple concord; as a tenth, compounded of an octave and third, is called a third; a twelfth, compounded of an octave and fifth is called a fifth; a fiftenth, compounded of two octaves, is called an octave, or double octave. And so on to a third series.

These are the compound concords.

All other proportions founded together are harsh and disagreeable to the ear; and are for this reason called discords.

From the compounding and dividing the proportions delivered, not only the harmonical intervals are computed, but the discords likewise.

And this the following calculations demonstrate.

The proportion of the octave is the proportion of the 4th and 5th: for, by compounding $\frac{3}{4} \cdot \frac{5}{4} = \frac{15}{16}$, or $\frac{5}{4}$ the proportion of the octave.

Again, it is the proportion of the sharp 3d and flat 6th: for, $\frac{9}{8} \cdot \frac{16}{15} = \frac{144}{120}$ in its lowest terms.

Again, the flat 2d and sharp 6th: for, $\frac{3}{2} \cdot \frac{16}{15} = \frac{24}{15}$ or $\frac{8}{5}$ the proportion of the octave.

Now, since the 4th and 5th, the 3d and 6th, as also the 2d and 7th, compounded, make the octave; that is, any two numbers making 9, the middle term or note being repeated, or common to both; it follows, that to fall a 4th or rise a 5th, as also to fall a 3d or rise a 6th, and to fall a 2d or rise a 7th, and the contrary, answers the same purpose of harmony; for they meet in the octave.

This observation will be of great use in setting the bass, and figuring the same, by producing that variety and contrary motion demonstrated necessary in the 4th axiom.

Proportion of the 5th.

The proportion of the 5th is the proportion of the sharp 3d and flat 3d; for by compounding $\frac{3}{4} \cdot \frac{5}{4}$ or $\frac{15}{16}$ the sesquialteral and known proportion of the 5th.

Proportion of the Sharp 6th.

The proportion of the sharp 6th is the compound proportions of the fourth and sharp 3d; for $\frac{3}{4} \cdot \frac{5}{4}$ or $\frac{15}{16}$.

Of the flat 6th, the proportion is of the 4th and flat 3d; for $\frac{3}{4} \cdot \frac{5}{4}$ or $\frac{15}{16}$.

By the same manner of compounding are found the proportions of the concords of the 3ds; which shall be shewn when we shall have got the tones and semitones; which, as being discords, arise by dividing the harmonic proportions as follows.

Proportions of the Discords proved.

Proportion of the Greater Tone.

The proportion of the greater tone is the difference of the 4th and 5th; for $\frac{3}{4} \cdot \frac{5}{4}$ the proportion of the greater tone.

Proportion of the Less Tone.

The proportion of the lesser tone is the difference of the 5th and sharp 6th; for $\frac{3}{4} \cdot \frac{5}{4}$ the proportion of the lesser tone.

Proportion of the Semitone.

The proportion of the semitone is the difference of the sharp 3d and 4th; for $\frac{3}{4} \cdot \frac{5}{4}$ the proportion of the semitone.

Having now the proportions of the tones and semitones, we are enabled to prove the proportion of the semitone, or flat 2d and sharp 7th to the 8th; as likewise all the remaining proportions, whether discord or concord: For, the 4th and sharp 3d, $\frac{3}{4} \cdot \frac{5}{4}$ give $\frac{15}{16}$ the greater 7th; and the sharp 9th and semitone $\frac{9}{8} \cdot \frac{15}{16}$ in its lowest terms $\frac{3}{2}$ the proportion of the octave.

To go on; The proportion of the sharp 3d is that of the greater.
greater and lesser tones; for, \( \frac{2}{3} \), \( \frac{5}{12} \), \( \frac{1}{6} \), \( \frac{1}{4} \), \( \frac{1}{3} \), \( \frac{1}{2} \) in its lowest terms, the greater 3d.

And the proportion of the flat 3d is compounded of the greater tone and semitone; for, \( \frac{2}{3} \), \( \frac{5}{12} \), \( \frac{1}{6} \), \( \frac{1}{4} \), \( \frac{1}{3} \), \( \frac{1}{2} \) in its lowest terms, the proportion of the flat 3d.

The proportion of the 4th is that of the sharp 3d and semitone; for, \( \frac{2}{3} \), \( \frac{5}{12} \), \( \frac{1}{6} \), \( \frac{1}{4} \), \( \frac{1}{3} \), \( \frac{1}{2} \) in its lowest terms, the proportion of the sharp 3d.

The proportion of the discord of the sharp 4th is found by compounding its constituent intervals, the 4th and semitone; for, \( \frac{2}{3} \), \( \frac{5}{12} \), \( \frac{1}{6} \), \( \frac{1}{4} \), \( \frac{1}{3} \), \( \frac{1}{2} \) the proportion of the sharp 4th.

And lastly, the proportion of the flat 7th is compounded of two 4ths, or \( \frac{1}{2} \); for, \( \frac{2}{3} \), \( \frac{5}{12} \), \( \frac{1}{6} \), \( \frac{1}{4} \), \( \frac{1}{3} \), \( \frac{1}{2} \) the proportion of the flat 7th.

These proportions, in the natural order of the first series, or sharp key, stand thus:

\[
\begin{align*}
K & \quad 2d \quad Sharp \ 3d \quad 4th \quad 5th \quad Sharp \ 6th \quad Sharp \ 7th \quad 8th \\
1 & \quad \frac{2}{3} \quad \frac{5}{12} \quad \frac{1}{6} \quad \frac{1}{4} \quad \frac{1}{3} \quad \frac{1}{2} \\
K & \quad 2d \quad Flat \ 3d \quad 4th \quad 5th \quad Flat \ 6th \quad Flat \ 7th \quad 8th \\
1 & \quad \frac{2}{3} \quad \frac{5}{12} \quad \frac{1}{6} \quad \frac{1}{4} \quad \frac{1}{3} \quad \frac{1}{2} \\
\end{align*}
\]

Hence we can demonstrate (what before was taken for granted) the places of the greater and lesser tones, and semitone.

Now, the relative proportion or difference is found by division of the two next proportions in the natural order as above.

The places of the greater and lesser tones and semitones in the sharp key.

1) \( \frac{2}{3} \), \( \frac{5}{12} \), \( \frac{1}{6} \), \( \frac{1}{4} \), \( \frac{1}{3} \), \( \frac{1}{2} \) the greater tone, or 2d.

2) \( \frac{2}{3} \), \( \frac{5}{12} \), \( \frac{1}{6} \), \( \frac{1}{4} \), \( \frac{1}{3} \), \( \frac{1}{2} \) in its lowest terms, \( \frac{2}{3} \), \( \frac{5}{12} \), \( \frac{1}{6} \), \( \frac{1}{4} \), \( \frac{1}{3} \), \( \frac{1}{2} \) the lesser tone, or flat 2d.

3) \( \frac{2}{3} \), \( \frac{5}{12} \), \( \frac{1}{6} \), \( \frac{1}{4} \), \( \frac{1}{3} \), \( \frac{1}{2} \) the greater tone, or 4th.

4) \( \frac{2}{3} \), \( \frac{5}{12} \), \( \frac{1}{6} \), \( \frac{1}{4} \), \( \frac{1}{3} \), \( \frac{1}{2} \) in its lowest terms, \( \frac{2}{3} \), \( \frac{5}{12} \), \( \frac{1}{6} \), \( \frac{1}{4} \), \( \frac{1}{3} \), \( \frac{1}{2} \) the lesser tone, or flat 4th.

The places of the greater and lesser tones and semitones in the flat key.

1) \( \frac{2}{3} \), \( \frac{5}{12} \), \( \frac{1}{6} \), \( \frac{1}{4} \), \( \frac{1}{3} \), \( \frac{1}{2} \) the greater tone, or 2d.

2) \( \frac{2}{3} \), \( \frac{5}{12} \), \( \frac{1}{6} \), \( \frac{1}{4} \), \( \frac{1}{3} \), \( \frac{1}{2} \) in its lowest terms, \( \frac{2}{3} \), \( \frac{5}{12} \), \( \frac{1}{6} \), \( \frac{1}{4} \), \( \frac{1}{3} \), \( \frac{1}{2} \) the lesser tone, or flat 2d.

3) \( \frac{2}{3} \), \( \frac{5}{12} \), \( \frac{1}{6} \), \( \frac{1}{4} \), \( \frac{1}{3} \), \( \frac{1}{2} \) the greater tone, or 4th.

4) \( \frac{2}{3} \), \( \frac{5}{12} \), \( \frac{1}{6} \), \( \frac{1}{4} \), \( \frac{1}{3} \), \( \frac{1}{2} \) in its lowest terms, \( \frac{2}{3} \), \( \frac{5}{12} \), \( \frac{1}{6} \), \( \frac{1}{4} \), \( \frac{1}{3} \), \( \frac{1}{2} \) the lesser tone, or flat 4th.

The use of this theory is chiefly on account of ascertaining the places of the semitones; the difference of the major and minor tones, which is as \( \frac{2}{3} \), \( \frac{5}{12} \), \( \frac{1}{6} \), \( \frac{1}{4} \), \( \frac{1}{3} \), \( \frac{1}{2} \) having not been hitherto reduced to practice.

We shall therefore hereafter admit no other distinction than that of whole and half tones.

The intervals then contained in the octave, in both keys, excluding the first term, will be more easily described thus:

The --- 2d is one tone.

Flat 3d a tone and a half.

Sharp 3d two tones.

I C K.

4th two tones and a half.

Sharp 4th three tones.

5th three tones and a half.

Flat 6th four tones.

Sharp 6th four tones and a half.

Flat 7th five tones.

Sharp 7th five tones and a half.

8th six tones.

Having found all the intervals, their order and proportions; it will be necessary to take in one view the semitones of the octave, marked by their different names and intervals. For every semitone hath two names in respect to the preceding and following note in the natural order. As in the following example. The knowledge of this is most necessary to learning the art of composition. No 7.

The discords being, as hath been shewn, the lefser 2d, or semitone, and greater 2d, the sharp 4th or false 5th, the lefser and greater 7ths, it is to be understood, that not any two or three of these are to be found together, to frame the discord; as the members of any concord are, to make the harmony: but each discordant note hath its discordant and concordant notes proper to itself, which will fill up the discord; and which are called the accompaniments.

The five discords, then, being distinct and unlike each other; the definition of discord must be this:

Discord consists in certain variable proportions of the distance of sounds, performed at the same instant of time, and disagreeable to the ear.

Chap. II. Of the Scale of Musick.

Having found that the larger combinations of the 13 semitones in the octave constitute the concords and discords; for the better application of them to our purpose, we shall next consider them singly and distinctly.

Diapason — — — Octave — 8th.

Semidipason

Defective 8th, or — — — greater sharp 7th.

Sept. major

Sept. minor — — — lefser flat 7th.

Hexachordon major — — — greater sharp 6th.

Hexachordon minor — — — lefser flat 6th.

Diapente

Defepentese, or — — — — — — sharp 4th.

Tri one

Diatessaron

Ditone — — — — — — — — — — — — flat 4th.

Semiditone — — — — — — — — — — — — lefser, or flat 3d.

Tone — — — — — — — — — — — — greater — — 2d.

Unison — — — — — — — — — — — — one found.

As they succeed each other in the natural order of both keys, as above demonstrated; this is called the scale of musick.

In this scale we shall likewise take a view of the concords of the same denomination, as they arise in succession from the same natural order of the simple tones, and also of the discords as oft as they occur.

There are two scales in use: the diatonic scale, and the chromatic.

In the diatonic scale, the notes arise by two tones, a semitone,
The Chromatic Scale.

The chromatic scale, which is no other than the natural semitones in their order, except the first tone, is only used when mixed with the diatonic. That is to say, when a semitone, not belonging to the harmony of the key, is introduced in the middle of a tone. And this may be done by the note ascending by a semitone, or defcending: in either of which cases, the key is changed in that part of the strain. This is the cause of great variety in the air; as well as it new-modulates the harmony. This is another effect of the semitone, on which turns so much variety and elegance. It must be executed by the composer with all the address and art imaginable. For this we must refer to the second part of practice, which will be given for the rules of the mixture of the chromatic. Pieces of music where it is frequently used, are now commonly called chromatic music.

The diatonic scale being that which we are chiefly concerned to understand, as well as the first in order, and before any use of the chromatic can take place, we shall proceed to view it in another light, whereby we shall discover such properties of it as will be useful to the composer. Sharp key. No. 12.

From the key the thirds ascend, as in the above example, by one sharp 3d, two flat 3ds, two sharp 3ds, a flat 3d, and lastly another flat 3d on the 2d to the key.

All the 4ths being perfect, are like; except that one which falls on the sharp 7th; this is called a sharp 4th, or false 5th. No. 13.

All the 5ths are perfect, and therefore like; except that formed by the sharp 7th and 4th, which likewise is a flat 5th or sharp 4th. No. 14.

The 6ths stand thus: two sharp 6ths, one flat 6th, two sharp 6ths, two flat 6ths. No. 15.

There are but two greater 7ths which are the sharp 3d and sharp 7th to the key: they stand under the two semitones.

All the 8ths are perfect and alike.

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found the 5th, which two are the constituent intervals of the octave. And the same division of the sounds is constantly preserved, if the length of an octave be equally divided between any two stops.

Again, the length of a 5th between two stops, or note and stop, equally divided; the half next the bridge gives the greater 3d, the other half the lesser 3d. And again, the length of the greater 3d, thus divided, gives the greater and lesser tone. And the greater tone's length, equally divided, gives the greater and lesser semitone. And the length of the greater semitone, equally divided, gives the sounds in proportion as 5 and 4. The greater interval being next the bridge, and so continually.

Hence the necessity of the greater and lesser tones and semitones in music is evident; and the truth confirmed, which is asserted in the 24th corollary.

Now, in the diatonic scale, wherever the semitones lie, that is, whether the air be in a flat or sharp key, the graver part of the tone will be the lesser semitone, and the acuter the great semitone; and in the chromatic, which ascends by semitones, the greater and lesser semitones will, for the same reason, succeed each other alternately. Wherefore, if any series of chromatic notes be removed a semitone higher or lower; it must happen, that the lesser semitone will succeed into the place of the greater, and the greater into the place of the lesser. Hence dissonances will happen in the diatonic scale, as being composed of the same materials with the chromatic, if the key be injudiciously changed by transposition. For, as the dissonance will be evident, if the transposition be by one semitone; so the disproportion will full appear, if the removal be by any odd number of semitones within the compass of the 4th.

As the proportions of the concords have been demonstrated from the division of a line; so are they likewise to be found in the geometrical proportions of solid bodies, and therefore may be illustrated by the same.

We shall begin with the proportion of the 8th.

The proportion of the 8th being the compound proportions of the 5th and 4th, is, by corollary of the 34th proposition of Archimedes, as the whole superficies of a right cylinder described about a sphere, to the whole superficies of an equilateral cylinder inscribed as 2 to 1. For, the circumscribed is to the spherical superficies as 12 is to 8 (by 22 of this), but the spherical is to the inscribed as 8 is to 6 by the present proposition; therefore the circumscribed is to the inscribed as 12 is to 6, or 2 to 1.

In harmonic terms thus expressed: the 5th is to a given note or key as 12 is to 8; but the proportion of the 4th is as 8 to 6. Therefore, the proportion of the 8th is as 8 to 5 as 2 to 1.

Again, the proportion of the 5th, and the next harmonic proportion arising out of the 5th, is beautifully illustrated in the admirable proportion of the sphere, right cylinder, and equilateral cone circumscribed about each other. The last proportion being invented by Andrew Fiacquet; and that of the two first by Archimedes, as demonstrated in his 45th proposition in Tacquet's Euclid.
PART II. THE PRACTICE OF MUSICK.

The practice of music is founded on the principles delivered in the theory. Its several parts are composition, figuring the bass, melody, transposition, and singing by note.

Of these we shall treat separately in the above order.

Composition is the setting together two or more notes in harmony, to be founded at the same time.

When in the succession of concords, in the parts, the notes of each part are of the same length, or time of sounding, the composition is called counterpoint.

When the succession of concords is by notes of different lengths in the several parts, it is called plain counterpoint.

The mixture of discord and concord, by notes of the same or different lengths or time in the parts, is called figurate counterpoint. Of these in their order: and first of all, we shall treat of composition, figuring the bass, melody, transposition, and the different clavus wherein the parts of music are usually written.

The following account of the proportions of the lengths of notes, the time and clavus, being well understood by every one acquainted even a little with music, might well have been omitted in an essay of this kind; (where, instead of using repetitions, it is hoped we have offered to the public something new; at least in the manner of demonstrating the rules of composition, both in discord and harmony;) but that we would leave nothing in our power untold, which may contribute to form a complete musician.

The longest note, now generally in use in instrumental music, is called a semibreve. Its time is as long as you can distinctly count for.

Out of the division and subdivision of the semibreve are formed the lengths of all other notes; according to the following proportions. No. 22.

A semibreve, whole time, is as one, two, three, four; as long as the end of this line with the other end A, by drawing AG; and then taking any point, as B, at pleasure, in the given line, there draw EF parallel to DG, and in it take BE equal to BF; and then draw EG, and that shall find the point C required: and when calling, as above, the whole line Z, A B = t, B C = m, and D C = c, I say Z = a : e : m,

\[ Z : e : : a : m \]

Wherefore Z \( \frac{a}{m} \) be to c.

And, to divide any given right line thus harmonically, as suppose AD: From either end of it draw a right line, as DG; make an angle with it, and of any length; connect the end of this line with the other end A, by drawing AG; and then taking any point, as B, at pleasure, in the given line, there draw EF parallel to DG, and in it take BE equal to BF; then draw EG, and that shall find the point C required: and when calling, as above, the whole line Z, A B = t, B C = m, and D C = c, I say Z = a : e : m.

For the triangles ADG, ABF, and BEC, are all similar: and consequently AD : AB :: DG : BF ; or as DG to BF, so BE to BC. But as DG : BF : CD : BC; (by working about the equal angles D and E, and the different clavus wherein the parts of music are usually written.) Therefore, by equality, AD : AB :: CD : BC; that is, Z : a : c : m. Q.E.D.

And from hence it is plain, that the ratio of the whole line AD, to the segment A B, may be taken as pleasure; but that the intermediate part B C must be less than either A B or C D.

A dot after any note, signifies the time of such note must be lengthened to one half of the plain note. No. 23.

The proportions are thus;

A dotted semibreve is equal to 3 minims.
A dotted minim to 3 crotchets.
A dotted crotchet to 3 quavers.
And so of the rest.

Thus we are furnished with notes according to the odd and even numbers. And this naturally divides the time of any song or music into odd and even time.

COMMON TIME.

When the air moves according to the even numbers; and every bar is measured by beating the time into two equal and even parts, the music is composed in common time: known by one of the following marks prefixed to the time, as the letter C, having 4 crotchets in a bar.

TRIPLE TIME.

But when the music moves according to the odd numbers; and every bar is measured by beating the time into two unequal parts, as two and one, the song is composed in triple time; which is known by one of these signs prefixed to the time.

3, or \( \frac{3}{4} \), for 3 minims in a bar.
4, 3 Crotchets in a bar.
5, 3 Quavers in a bar.
6, 3 Crotchets in a bar.
7, 3 Quavers in a bar.
8, 3 Semiquavers in a bar.
9, 3 Demisemiquavers in a bar.
10, 3 Crotchets in a bar.
11, 3 Quavers in a bar.
12, 3 Semiquavers in a bar.
13, 3 Demisemiquavers in a bar.
14, 3 Crotchets in a bar.
15, 3 Quavers in a bar.
16, 3 Semiquavers in a bar.
17, 3 Demisemiquavers in a bar.
18, 3 Crotchets in a bar.
19, 3 Quavers in a bar.
20, 3 Semiquavers in a bar.
21, 3 Demisemiquavers in a bar.
22, 3 Crotchets in a bar.
23, 3 Quavers in a bar.
24, 3 Semiquavers in a bar.
25, 3 Demisemiquavers in a bar.
26, 3 Crotchets in a bar.
27, 3 Quavers in a bar.
28, 3 Semiquavers in a bar.
29, 3 Demisemiquavers in a bar.
tion of their lengths, contracted into the time of 2 quavers, or one crotchet, contantly noted by the figure (3) over them.

And lastly, the most common movement of jiggs, which is by fix or twelve quavers in a bar, have their bass, for the smoothnes of the movement, often written in plain crotchets; 2 in a bar for the treble \( \frac{3}{4} \); and four, marked thus C, for the treble \( \frac{4}{4} \). It is plain, therefore, that all tunes in these movements truly belong to common time, since every bar is measured by the beating, or dividing it into even parts, as expressed in the bass.

A pause or rest in musick, is a cessation of the sound, in one or more of the parts; or of all the parts together. Nothing hath a finer effect in musick than a pause of all the parts judiciously made; or of one, or more of the parts, for the sake of imitation. The rests therefore are written down in the place of notes, and each note hath its own rest, which is of the same length with the note whose name it bears. Thus,

A semibreve rest is as long as a semibreve. A minum rest as long as a minum.

And so of the rest.
The next thing to be considered is the cliff in which any part of the musick is laid to be written; according as the cliff is prefixed to each flave of the writing.
The use of the cliff is to ascertain the names of the notes; and to denominate that part of the musick to which it is prefixed.

There are three cliffs, to answer and distinguish the three parts in musick: The bass, or F cliff; the tenor, or C cliff; and the treble, or G cliff.

The bass is so called, from its being the lowest part, the tenor, or middle part, hath its name from holding the bass and upper parts together. This will be clearly understood, when we shall have learned to compose in four parts.
The uppermost part is called the counter-tenor in vocal musick; and, in instrumental, the first treble.
The bass and treble cliffs are now constantly written in the same places as in the examples. The tenor cliff is often removed, according to the fancy of the composer or writer of musick; to answer the convenience of the notes standing, as much as may be, within the compass of the five lines, or flave. Which convenience is the reason for the invention of the diversity of clifs, as well as the uses already named. For it is easy to apprehend, that the natural tones, and their proportions, are invariably the same, whether expressed by the voice, or an instrument, however they may be distinguished by artificial signs. Observe, that the clifs, according to their names, rise above each other by the interval of a 5th; thus the tenor is equally distant from each other part. For C is a 5th to F, as it is also a 5th below G.

**Chapter I. Of Composition in Counterpoint.**

**Composition in counterpoint is when, in the succession of concords in the parts, the notes of each part are of the same length, or time of founding.**

According to the 2d axiom, we shall begin with the harmony of the key note; and proceed to demonstrate the harmony of the remaining notes of the octave in their natural order.

**Demonstration of the Harmony of the Key.**

The harmony of the key is the concord of itself. The harmony of the key must be perfect harmony. Now, the notes concording in perfect harmony, are, by corollary 3d, the 3d, 5th, and 8th. But these, with the key, are the concord of itself. Therefore, the harmony of the key is the concord of itself.

This demonstration is grounded on this evident truth; namely, that any other concord would, by the term, or name of it, in effect change the key; whereby the unity of the tune would be destroyed, and by this contradiction the author's meaning rendered unintelligible. The necessity of perfect harmony in the key being evident, no other sort of demonstration is required, nor indeed can be admitted.

Let it be required to set a bass to the notes of an octave ascending in G sharp. No 25.

Any one of the three notes in the bass is concording, by corollary 3; but the 8th is preferable when it is the first or last note of the tune; for thus it best ascertains the key. The preference of either of the other two depends on the following rules.

First, The 5th cannot take place when the concord immediately preceding shall happen to be a 5th, the forbidding the consecution of 5ths being ascertained in corollary the 4th.

Again, the movement of the bass ought generally to be by descending a 5th, or rising a 4th, 6th, or 8th, or any other great interval; whereby meeting the treble, and effecting variety and contrary motion of the parts; the established rules of harmony by the 4th axiom.

Lastly, The air of the bass must be consulted; and, if possible, an imitation of some foregoing passage in the upper part.

The application of these rules will decide which of the two or three notes is preferable in this or any other concord.

**Demonstration of the Harmony of the 2d.**

The harmony of the 2d is the concord of the 5th. The harmony of the key having been shown, we must consider it as an immovable point, in relation to which we are to order the rest of our computations, consistent with the established principle of uniformity.

The 2d to the key immediately descending into the key, will have, for its next concordant note, the greater 7th; which at the same time ascends by a semitone into the key; to which 7th the 2d is a 3d.

For, by axiom 2, the combination of sounds are deduced from the natural order of notes ascending and descending. But the 2d and 7th can admit no other concordant note but the 5th to the key. For the 3d is discord with the 2d; and the 4th, 6th, and 8th discord with the sharp 7th.

Now, the 2d, 7th, and 5th are the concord of the 5th; therefore, the harmony of the 2d is the concord of the 5th. No. 26.
The 5th must always be taken at the close; or when the treble is descending into the key; for then the bass will fall a 5th into the key; which movement is called the great cadence. Otherwise the 7th or 5th may be taken indiscriminately; yet, under the restriction of the rules, (p. 326. col. 2.) for setting the harmony of the key.

**Demonstration of the harmony of the 3d.**

The harmony of the 3d is the concord of the key.

From the demonstration of the harmony of the key, the key will have its 3d; and, by inverting, the 3d will have the key. Now, the key and its 3d will admit no other concordant note but its 5th. For the 2d is discord to both, the 4th is discord to the 3d, and the 7th discord to the key; but the key, its 3d and 5th, are the concord of the key. Therefore, the harmony of the 3d is the concord of the key.

The 6th indeed, which is a 4th to the 3d, which is an improper concord, will, with the key, form the concord of the 6th; but the demonstration of the concord of the 6th in a sharp key, depending on another principle, as will be shown in its place, can, for the same reason, bear no relation to the harmony of the 3d, which is a member of the key. No. 27.

The two notes in the bass may be taken indiscriminately; yet complying with the rules. (p. 326. col. 2.) But, if the 3d in the treble be prepared to descend into the key, by its passage into the 2d, then the 5th is more eligible; which falling an 8th for the next note, thence descends by a 5th into the key. This is the most fitting movement of the bass; and, at the same time, the most common, at a final close in either flat or sharp key.

**Demonstration of the harmony of the 4th.**

The harmony of the 4th is the concord of itself.

In a sharp key, the places of the two greater 7ths are the sharp 3d and sharp 7th to the key; and, of the semitones, the 4th and 8th, or key; Therefore, the 3d is to the 4th as the sharp 7th to the key. Now, since by axiom 2d, the combinations are deduced from the natural order of the notes ascending and descending; the harmony of the 4th will be as the harmony of the key. But the harmony of the key is (by demonstration 1.) the concord of itself; therefore, the harmony of the 4th is the concord of itself. No. 28.

The notes in the bass may be taken indiscriminately: only observing the foregoing rules. If a close on the 4th be prepared from the 4th itself, either note will do; yet the key is preferable, in order to prepare for the great cadence.

**Demonstration of the harmony of the 5th.**

The harmony of the 5th is the concord of the key.

From the demonstration of the harmony of the key, the key will have its 5th; and, by inverting, the 5th will have the key. Now, the key and its 5th will admit no other concordant note than the 3d. For, the 2d and 4th are discord to the key and 5th; the 6th discord with the 5th; and the 7th discord with the key. But the key, its 5th and 2d, are the concord of the key:

**Demonstration of the harmony of the 6th.**

The harmony of the 6th is the concord of the 4th.

From the demonstration of the 4th, its harmony is its own concord. The 4th, then, will have its 3d; and, by inverting its 3d (that is, the 6th) will have the 4th. Now, the 4th and 6th will admit no other concordant note than the 5th: For the 2d is, (with the 4th and 6th,) a discord, as will be shown in the demonstration of the discords. The 3d and 5th are discord to the 4th, and, the 7th to the 6th. But the 4th, 6th, and 8th, are the concord of the 4th: therefore, the harmony of the 6th is the concord of the 4th. No. 30.

Either note in the bass may be taken at will. But if there be a preparation for a close on the 4th, the second note, or key, is preferable, for the reasons assigned in the demonstration of the 4th, which is, to make the great cadence, prepared by the bass, first descending an 8th, and then a 5th, into the 4th, or close.

**Demonstration of the harmony of the 7th.**

The harmony of the 7th is the concord of the 5th.

The harmony of the 7th is part of the harmony of the 2d, (by demonstration 2.) but the harmony of the 2d is the concord of the 5th: therefore the harmony of the 7th is the concord of the 5th. No. 31.

If the 7th, or treble note, precede a close on the key, the first note in the example must be the bass note, in order to make the great cadence.

The 8th being the key, hath for harmony its own concord; as by demonstration 1.

From the foregoing demonstrations, the bass notes, set to the 8 ascending notes in the treble, will stand thus.

**General Rule.** The consecution of 8ths, 7ths, and 4ths, is not allowed. (as by corollary 4.) except by contrary motion of the parts, or in the passage of very quick notes in composition of many parts. No. 32.

From taking in one view the harmony of the seven notes, we shall deduce some useful corollaries. No. 33.

Key 2d, 3d, 4th, 5th, 6th, 7th, 8th, hath the harmony of the Key 5th, Key 4th, Key and 5th, 4th, 5th, Semitone. Semitone. Semitone.

Cor. I. Every note in the octave (except the 2d to the key) admits in its harmony a 3d.

Cor. II. The key, the 2d and 5th, admit in their harmony a 4th.

**Scholia.**

When the key admits a 4th, the concord is of the 4th. When the 2d admits a 4th, the concord is of the 5th. When the 5th admits a 4th, the concord is of the key.

Hence the interval of that note which admits a 4th, is in fact a 5th; therefore two 4ths are no more allowed in
This then demonstrates what was asserted, by way of pre-theory) to be the most sparingly used, as not producing it makes a part of harmony.

In consecution than two 5ths. And hence likewise the interval of the 4th, which we have called an improper concord, appears to be of a middle nature between concord and discord; being a fourth in name and appearance in the natural order of sounds; yet a 5th in name and effect in composition, as member of that chord wherein it makes a part of harmony.

Con. III. The key, the 4th and 5th, admit in their harmony a 5th.

When the key admits a 5th, the concord is of the key.

When the 4th admits a 5th, the chord is of the 4th.

When the 5th admits a 5th, the concord is of the 5th.

Hence, when a note admits a 5th, the harmony is the concord of the same note.

Cor. IV. Every note but the 4th admits a 6th; for, the 4th having its concord for harmony, will have only its 5th.

Every note admits its 8th; for any note may be substituted for its octave. But 8ths are (by corollary 4. of the theory) to be the most sparingly used, as not producing that variety or mixture of sounds requisite to bind the harmony, especially, where it can be best avoided, in the composition of two parts.

From the foregoing demonstrations and corollaries, arise the following observations.

The 3ds and 6ths most frequently occur in composition. This then demonstrates what was asserted, by way of precept, in the 4th corollary of the theory as well as part of the 4th axiom; namely, that the proportions of musical sounds, and the variety emerging from them, point out to us this variety, and will not suffer us to depart from the established precept.

It will be necessary to see the same truths confirmed in the following notes. We shall therefore set down instances of composition in the following notes of the octave upon the same principles, and wherein the same demonstrations and corollaries do take place.

Example of composition in the following notes of the octave. No. 3d.

In the ascending notes, when the upper part rises by a semitone, the bass generally falls a 5th; when the upper part falls by a whole tone to a close, the bass also falls a 5th. This fall of the bass, or great cadence, must be effected when chromatic notes are introduced ascending; it being the property of the new semitone, thus formed by the note rising a half tone, to imitate the key or close. By axiom 2, the proportions of sounds, and properties of the same, are deduced from the natural order of the notes. Now, by the new semitone introduced, the note below imitates the greater 7th to the key: therefore in this case, as in a close on the key, the bass must fall a 5th.

Notwithstanding, this must be understood not of the passage of quick notes; and chiefly at a close.

Sect. 2. Of Composition in a Flat Key.

From the difference between the flat and the sharp key which lies in the different places of the semitone, there will arise a variety in the composition in a flat key, yet resting on the principles and demonstrations delivered in the last section.

The places of the semitone in the sharp key are the 4th and 5th. In a flat key, the semitone stands in the 3d and 6th places. The variety in the composition will happen where the semitones are concerned. For, as the middle close is made in the sharp key on the 4th, which is the semitone; or, as the 4th in the sharp key hath (by demonstration of the harmony of the 4th) its own concord for harmony: so the middle close in the flat key is made on the 3d, which is the semitone; or the flat 3d will have for harmony its own concord. Now, as the 4th hath its 3d and 5th for harmony, (which are the 6th and 8th of the key,) so the flat 3d will have its 3d and 5th, which are the 7th and 9th of the key.

Again, the flat 7th of the key being the 5th to the 3d, will, like the 5th of the sharp key, have for harmony its own concord. This will cause the 2d of the key to appear as the sharp 7th to the 3d, and the 4th of the key as a 2d (which it really is) to the 3d. Thus the whole harmony will be new modulated by the power of the semitone. Again, the flat 6th being the semitone, a middle close may be made on that note; and then the same proportional variety succeeds, and new harmony, as in the former case.

Lastly, at the end of the music, where there must of necessity be a close, the flat key will have the greater 7th, like the sharp one. Of so great consequence is the semitone. Nor indeed can a close be made at all, without the passage of a semitone in one or other of the parts. No. 35.

Differences in the flat key noted.

In the first example the harmony of the 2d is the concord of the flat 7th, as being 5th to the third. The close is made on the 3d, the bass falling a 5th. The 4th has its own concord, as in the sharp key. The 5th standing in an octave, may be understood as part of the harmony of the 3d, as the 3d to the key, in a sharp key.

The 6th is part of the 4th's concord, as in the sharp key; as above in the remark on the 4th.

At the close, there is the sharp 7th, from which the bass makes the greater cadence.

In this example there happen four 8ths: the first and last are absolutely necessary to ascertain the key; by the second there is a close made on the 3d; and that on the 5th, is for the sake of the air in the bass.

In the second example, the harmony of the 4th is the concord of the flat 7th, as 5th to the 3d.

The harmony of the flat 6th is its own concord, being the place of the semitone; where the bass rises a 4th (the same as falling a 5th) as a close on the treble ascending by the semitone.

In the 3d example, these differences of the flat key are left out; and the notes set as if they were part of a sharp key: that is to say, there is no close made on the 3d; the 4th hath its chord for harmony; and the 6th is likewise part of the harmony of the 4th.

For, notwithstanding the propriety of making a close on the 3d and 6th, which are semitones; yet the composer...
is not under the necessity of making a close in those places in every passage; and then he is at liberty of setting the notes as in the example. This observation clearly points out the difference of composition in a flat key, and where it is to be practised.

And indeed an author, whose sole end is to please the ear, will defignedly introduce a close on the flat 3rd, and in as many other passages as he can, to create the variety so much desired. In these cases, the rules delivered for composition in the flat key must undoubtedly take place.

The fourth example is set to shew the movement of the bass to the descending notes. The composition is the same as in the other examples.

Let us now take, in one view, the full harmony of every note in the flat key, and where the difference between it and the sharp key lies: from which we may derive some useful corollaries. No. 36.

The harmony of the
2d, 3d, 3d, 4th,
is the concord of the
Flat 7th, 3d, Flat 6th, Flat 7th.

Cor. I. The 2d admits a 3d; then the concord is of the flat 7th.
Cor. II. The 3d admits a 5th; the concord is of the flat 6th.
Cor. III. Again, the 3d admits a 4th; then the concord is of the flat 7th.
Cor. IV. The 4th admits a 4th and 6th; the concord is of the flat 7th.

By comparing these with the corollaries on the sharp key, it will be evident, that each note in the flat key admits for its harmony that note which was excluded in the sharp key. And therefore, that all harmony is divided between the flat and sharp keys; and wonderfully diversified by changing the places of the semitone.

From the demonstration of the harmony of the 7th, with corollary 3, on the sharp key, and the solmisation 3, on the same, we gather how great a share of the harmony belongs to the 7th. For it is part of the harmony of the key, and of the 2d (which chord is its own, or that of the 7th) in both flat and sharp key: and, in the flat key, it is likewise in the harmony of the 2d.

The nature and properties of the semitone being the same in both keys, we can now more clearly demonstrate the harmony of it in the following manner.

The harmony of every semitone is the concord of the same.

The key always stands between the greater 7th below, and the whole tone, or 2d, above. Now, by axiom 2, of the theory, the proportions, properties and relations of sounds are deduced from the natural order of the notes ascending and descending: The 4th (in a sharp key,) the flat 3d, and flat 6th, being semitones, are distant by a half tone below, and a whole tone above, is the key; therefore they have the same properties with the key. But the harmony of the key is the chord of the key: therefore the harmony of the semitone, or 4th, flat 3d, and flat 6th, is the chord of the same. Hence we raise the following axiom.

Axiom I. The harmony of every member of the concord of the key, is the concord of the key. And the harmony of every note in the compass of music, proved by the rules of harmony, is part either of the concord of the key, or of its 5th, or of a semitone. Hence variety in music is introduced by the contrary motion of the parts, and by changing the key, by bringing in new semitones. The better to illustrate this axiom, we shall hereafter in the examples set harmonical figures over every note, expressive of the chord.

First Example.

Let it be required to set a bass to this treble in G sharp.

Harmony of the

Second Example. No. 38.

Harmony of the

Third Example.

In A flat, No. 39.

Fourth Example.

In G flat, No. 40.

Fifth Example.

In A flat, No. 41.

Sixth Example.

In D sharp, No. 42.

In these examples every passage occurs which hath been delivered in the precepts of composition.

Take notice, that in the last example, the four passages, where the harmonic figures are not set over the notes, are part of a discord; which would take place, if the composition were in three parts; and which we cannot explain till we come to figurate descant.

Sect. 3. Of Composition in Three Parts.

The harmony, or full concord, of every note being well understood, both by reading the foregoing examples, as well as making application of the rules of composition on which the examples are framed, by trial of setting basses to other airs; the next step will be to proceed to composition of three parts.

This requireth no other precept than those already delivered, touching the harmony of each note. For the third part consists of the remaining notes of each concord which have not been made use of in the composition of two parts. Yet this caution must be used, that the two upper parts stand in the nearest concord to each other: that is to say, in 3ds as much as may be, and is consistent with variety and contrary motion of them. For hereby two points will be gained: first, it will bind the harmony; and secondly, the bass, being more at liberty to rise and fall by greater intervals, will meet the upper parts at every point, and produce variety by his contrary motion. The following examples are the same let in two parts above.

Prob. Let it be required to set a bass and second part to this treble. No. 43.

Prob. Let it be required to set the ascending notes of the octave in three parts, in a flat key.

In G flat, No. 44.

In A flat, No. 45.

In G flat, No. 46.
The harmony of the seventh bar in the last example, is altered in the repetition; though the notes of the first treble be the same.

In the first instance, the concords are of the key and 4th. In the repetition, the concords are of the 3d and flat 7th.

In the first instance, the passage from the 5th into the key, (in the 8th bar,) being the great cadence, is just.

But if otherwise a close had been made on the 3d, (in the 8th bar,) the harmony in the second instance, is of the key, and that of the 2d the concord of the 5th; or, when the harmony of the 3d is to be its own concord, and that of the 2d or 4th part of the concord of the flat 7th.

Hence it will be easy to decide in all flat keys, (to which only this case belongs) when the harmony of the 3d is to be part of the concord of the key, and that of the 2d the concord of the 5th; or, when the harmony of the 3d is to be its own concord, and that of the 2d or 4th part of the concord of the flat 7th.

Hence, and from corollary 1. of the theory, and from the demonstration of the harmony of the semitone, we deduce this general theorem.

The truest harmony is produced by the whole concords taken together falling in succession, as frequent as is consistent with the approved rules of harmony, by a 5th.

We shall put an end to composition in three parts, with the following example in a flat key, being one of the above in two parts. No. 47.

The use we shall make of this example is to remark, that although the basses be altered from that which is set in the same example in two parts: yet the harmony is the same, as is evident from the harmonic figures set over each.

Secondly, The 4th having its own concord, passes into the key, or 3d, in the passage of quick notes, and where there is not a close. But where, on the 6th bar, a close is made on the 3d, the basses making the great cadence, the 4th in the preceding bar is part of the concord of the flat 7th. And thus the whole harmony falls a 5th.

We have altered the basses also to answer the purpose of the movement of the upper parts in the closest harmony. And likewise to prove, that composition of many parts differs from that of two only. A truth which every composer should always have in view. For it will be found, upon trial, that, when the musick is set in two parts, if it be required to add a third, it will not be in the power of the composer to give that third part an air. A matter which ought to be studied by all means; and which, is evident from the example, can be executed, without injuring the harmony in the least, by composing the three parts together.

We therefore recommend it to the practitioner to make himself perfect in the composition of two parts, before he engages in three; as he will thereby not only sooner become master of the harmony; but also, by discovering more clearly the difference we are pointing out, will execute the composition of three parts with more ease and propriety.

Sect. 4. Composition of Four Parts.

In composition of 4 parts, every note in the concord is taken; or to every note there is full harmony.

The fourth part, or tenor, now to be added, consists of the remaining note of the concord, which was not used in composition of three. The octave therefore will take place in the concord of every note. The consecution of which, as well as of 5ths and 4ths, is to be avoided between the same parts. The rules already delivered in the composition of three parts must be attended to in this.

Example of the ascending notes of the octave in composition of 4 parts. No. 48.

Second Example.

In the descending notes of the octave in composition of 4 parts. No. 49.

Third Example in 4 Parts.

In A flat, No. 50.

Fourth Example in 4 Parts.

In G flat, No. 51.

In composition of 4 parts, it was said, that to every note there is full harmony. Notwithstanding, in the first example, the sixth notes of the first treble and tenor are in unison; each being a 6th to the bass; so that the octave hath no part in that concord. This is done to avoid the consecution of 8ths, by the succeeding note of the tenor, whose place must be, for the air's sake, the 8th to the bass, as well as to bind the harmony.

In the second example, the seventh notes in the first and second trebles are in unison; both being a 5th to the basses. Let not this be understood to be a consecution of 7ths, as they are members of the same chord; but is done for the sake of the air of the second treble. Let this remark serve for every like instance which may happen hereafter.

In the fifth bar of the third example, the second note, the second treble and tenor are in unison. This is done to avoid the consecution of 4ths, which, had the tenor kept his place, would have happened from the foregoing note between the first treble and tenor.

In the same example, there is a consecution of 5ths in the two next bars, by the tenor falling a 4th, and the basses rising a 5th. This seeming error is tolerated since it is effected by contrary motion of these parts. For as well as it is by the contrary motion of the parts, that the consecution of perfect concords is avoided; so for the same reason, the sameness of the harmony disappears, or escapes the ear; especially in composition of many parts.

By this reason, the consecution of 4ths is prevented by the basses rising a 3d, according to the first obligation on this example, at the 5th bar. For that would have happened by all the parts descending; that is, not having contrary motion. The second note then of the basses in that bar is changed from that which is set in the same example in three parts.

A few general remarks occur in this place, from comparing the composition of four parts with that of three.

First, Whereas the perfect concords have place in some part of the harmony of every note in musick of 4 parts; so the chances of the consecution of 8ths and 5ths being more frequent, the more skill and attention will be required to avoid them.
Section 5. Composition of Five Parts.

The four concordant notes answering exactly to four parts in composition; when a fifth part is to be added, it is evident one note of the harmony must be repeated in every concord. The fifth part therefore consists of the notes which are by turns repeated in each of the former, in which the avoiding the consecution of the perfect concords is to be observed as before; and the air of this part attended to as far as may be consistent with the rules delivered.

Example of composition of 5 parts in the ascending notes of the octave. No. 52.

Second Example in 5 parts. No. 53.

The two octaves between the tenor and bass on the sixth and seventh notes of this example, are allowed; as the parts do not move into other notes, or make a new concord.

Third Example in 5 parts. No. 54.

The consecution of 5ths between the tenor and bass is admitted, as they meet by contrary motion of the parts.

Fourth Example in 5 parts. No. 55.

It is observable from these examples, that the most difficult composition is that of 4 parts. The other 4 parts, consisting of a repetition of one or more of the concordant notes of the first 4 parts, are more easily contrived, nothing more being required than to avoid the consecution of the perfect concords between any two parts.

Section 6. Composition of Six Parts.

In music of six parts there is a repetition of two concordant notes. The sixth part therefore consists of the notes which take place in each of the five former, by turns.

An example or two will sufficiently illustrate this.

Example of composition of 6 parts. No. 56.

There is a consecution of 8ths between the fourth line and bass, on the 3d and 4th notes; but it being the effect of contrary motion is admitted.

Second Example in 6 parts. No. 57.

The two 8ths between the tenor and bass are allowed; for, as they do not move, they are in effect but one.

Third Example in 6 parts. No. 58.

The consecution of 8ths is by repetition of the same note, and therefore reckoned as one.

Fourth Example in 6 parts. No. 59.

In the 8th bar there is a consecution of 8ths between the third part and tenor effected by contrary motion of these parts.

Section 7. Composition of Seven Parts.

In composition of seven parts, three notes of the harmony are repeated in each concord. The seventh part therefore consists of the notes which are taken by turns from each of the six former; or, which is the same thing, from the first four; under the restriction of the rules concerning the consecution of 8ths, 5ths and 4ths between any two of the parts, unless produced by contrary motion of the same, or repetition of the notes, or in the octave, as said above. The seventh part is written in the tenor cliff, and is a second tenor to the first; so that, like the upper parts, it must stand in the nearest concord to the first tenor, or next part.

First example of composition of 7 parts. No. 60.

Notwithstanding it hath been said, that three notes of the harmony are repeated in each concord in seven parts; yet it doth not appear in every instance in the example. The reasons are, that in every close, whether middle or final, it is preferable that most of the parts should end in the concord note of the close, and especially of the last close, that the harmony of the key may make the deeper impression on the sense.

Secondly, The air of each part should be consulted; for this will not only justify, but demand the changing of one note of the harmony for another.

Again, as the parts next each other should stand in the closest concord; so, in order to effect this sentiment by contrary motion, they will meet in unison; and therefore the repetition of the three notes will not take place in every chord.

These rules will be sufficient to answer any doubt, or determine any choice to be made of any note of the concord, as well as justify the meeting of the parts in unison, in music of any number of parts whatever.

Second example in 7 parts. No. 61.

Third example in 7 parts. No. 62.

Section 8. Composition of Eight Parts.

The eighth and last part is the second bass; consisting...
ing which the following rules and observations must be premised.

If the music be composed for voices and instruments in full choir, it will be elegant and proper that the second bass and in the nearest concord with the first, after the example of the trebles and tenors.

The reason is, that the two choirs singing either together, or in responses, will thus exhibit greater variety.

After this manner we shall set the two following examples.

If the music be for instruments only, the difference of the basses consists in two things: First, the organ hath the figures of the thorough bass written. Secondly, the bass viol performs the solo parts, while the organ reffers. And in full concert the two basses move in unison. This is the manner in which the basses of instrumenental music are set by the most approved masters.

We shall in this place offer our opinion on the subject of two basses in instrumental music, relating to some alteration from the usual method of practice described above; which, as being perhaps new, will be received according to the notice it deserves.

We would have the part for the organ move in long notes, and by the least intervals; the figures filling up the harmony and discord; while the part for the violoncello moving in quicker notes, and greater intervals, becomes deficient to the other basses. Of this an example shall be given when we come, in the next place, to treat of plain descant.

To return: In music of 8 parts, the four notes of every chord are repeated, (allowing the exceptions remarked above.) Therefore, the full harmony of every note is double. The due mixture of which, according to the rules delivered, and the contrary motion of the parts, produce all the variety which harmony without discord is capable of affording.

First example of composition of 8 parts. No. 63.
Second example in 8 parts. No. 64.

Having given examples sufficient for instruction in composition of harmony in the several parts of music, and having illustrated in the same examples what hath been said concerning the harmony proper both to flat and sharp keys; we shall proceed to make such observations on composition in general, as may assist the practitioner in the application of the rules at the beginning, or first attempts.

And first, concerning the confection of perfects; which must be avoided, except in contrary motion of the parts, or repetition of the concord in the same notes in each part, or in the octave.

Let the intervals which constitute the octave be remembered, as hath been said above (in p. 321.) namely, a 5th and 4th, a 6th and 3d, a 7th and 2d; taking care, that when the note of one part rises or falls by one of these intervals, the note of the other part should not fall or rise by the interval which is the complement of the octave.

Thus the confection of 8ths will be easily avoided, and much trouble thereby saved in setting the parts.

Again, by the same caution, we avoid the confection of 5ths. For the notes set in the concord of a 5th, rising and falling together in the different parts, in the same constituent intervals of the octave, will likewise meet in a 5th; and, by avoiding such movement of the notes of a 4th, the confection of the same is in the same manner prevented.

One instance of each will shew this evidently. No. 65.

The confection of perfects, it is true, is tolerated, when effected by contrary motion of the parts. But these observations are made for the sake of a beginner, that he may not too often incur the abuse of this liberty.

The next observation is concerning the harmony of the 4th in a flat key.

The 4th in a flat key is either part of the concord of the flat 7th, or hath for harmony its own chord.

The harmonical figures over the examples point out this to flight. Notwithstanding, it may be asked in what case either harmony is to be preferred.

We shall endeavour to ascertain this matter upon the principles on which what hath been already taught is demonstrated.

In page 430. col. 1. we deduced this general theorem; That the truest harmony is produced by the whole concords taken together, falling in succession, as frequent as is consistent with the approved rules of harmony, by a 5th.

Therefore, when a close is made on the semitone, or flat 3d, the harmony of the 4th or immediately preceding note, must be the concord of the flat 7th. For thus the whole chord, or harmony, according to the foregoing theorem, falls a 5th.

And this theorem extends to the harmony of every note whose interval is a semitone, or which stands a half tone above and a whole tone below its contiguous notes, whose movement into the next chord must be falling a 5th.

The places of the semitone in the harmony of the key, are the key, the flat 3d, the 4th in a flat key, and the flat 6th, and not in the harmony of the key, whereas a semitone is introduced by the addition of a sharp or flat, whereby a close may be made on the semitone above.

Thus the truth of the first axiom of the practice is established; where it is said, That the harmony of every note in the compass of music, proved by the rules of harmony, is part of the concord of the key, or its 5th, or a semitone. For the flat 7th is to the flat 3d a 5th.

In the other case, when a close is not made on the flat 3d, or when the harmony need not fall a 5th, then the 4th may have for harmony its own chord. And here the 4th stands generally in the basses. Thus No. 66.

The proof of this depends on the relative proportion of the flat and sharp keys; and will be given, by that analogy, under the article of transposition.

The last observation is in respect of the practice of authors of instrumenetal music, in composition of many parts.

Whereas in the composition of 7 and 8 parts, the harmony of the notes are doubled; this is effected by the common practice, after the most easy manner, by doubling whole parts; that is to say, by two alternate parts moving through every note in unison, when in full concert; and likewise other two alternate parts. Thus the first and third violins play in unison; and the second and
and fourth. And, when these parts are not thus doubled, the third and fourth parts relt. Or otherwise, in some passages they take part of the harmony from the other parts, as in the examples above of 7 and 8 parts; excepting only in longer notes than the upper parts. The concertos of Corelli, Geminiani, and the overtures of Handel, are instances of this.

In a word, whatever form the parts of music may be disposed in, the principles of harmony are the same.

And when the rules of composition in counterpoint, which is the ground-work, are well understood, and confirmed by practice, the remaining part will become easy in proportion as the composer will find himself more at liberty to dispose of the parts to such advantage as he will judge most suitable to the genius of the music he is about to compose.

CHAP. II. OF PLAIN DESCANT.

The second manner of composing is when the succession of concords is by notes of different lengths in the several parts. It differs from counterpoint, not in the principles of harmony, but only in the form.

The effect of descant is variety; which is produced, either when two or more notes of one part are set against one note in another, or when a long passage in one part is set against a single note in the other. This last manner is properly called descanting on that note. Or lastly, When a subject is set in the basses, and constantly repeated; while at every repetition of the same, there is a variation in the treble, which diversifies the harmony, but doth not deviate from the rules of art.

This bass, which is the first written part, is called a ground bass; and the piece of music is called a ground.

Again, in descanting, it is usual for the parts to relieve each other; the basses sometimes holding the note, while the descant is in the treble; and again, the note is held in the treble, while the descant is in the basses.

The finest descant is where the discords are introduced in the passage of the notes. For here the air is least constrained; and the variety, in respect of the harmony, greater. This is figured descant, which shall be treated of in the next chapter.

To return to plain descant: The movement of every part is more free than in counterpoint; and not so easy and unconstrained as in figured descant. From this then arise its chief uses.

In the first place, it is the best introduction to the practitioner, to give an air to every part of his music: It is also the ground-work of inventing variations upon a plain subject in the same part. The rules for plain descant are these.

Every note in the descant must be one of the harmony of each note in the bass; as demonstrated in composition in counterpoint.

Secondly, If the descant be variation on a given subject, in the treble, the original air must be preferred as much as possible in imitation of the same.

The harmony then being the same as in counterpoint, the difference being only in the form or length of the notes, one example, after so many given in counterpoint before, will be sufficient to illustrate this part.

Whatever the subject of descant may be, whether a ground bass, or air in the treble, (the descant on which is called variations,) the practice is the same; as in the example, where the bass is the ground to the four trebles, and the other three descant on the bass; as well as variations on the subject, or first line.

For the more easy execution of both kinds, take these following rules of practice.

If you are to raise descant on a ground bass, then on this supposition the bass is first framed. Next let plain notes in the treble be set, as in the example, though no other use were to be made of them than to guide the composer's eye, and thereby furnish matter more readily for a better air and for the descant.

If the subject be an air in the treble, on which you are to make variations; as in this case, the air is the first part written, so it is the object on the book to which you are to attend contentantly as a pattern for the variations or descant.

It would be advisable also to set a plain bass to the treble or plain song, before you begin the variations. For, as the basses, or second note, in many cases determines the concord of the note; it thereby assists and rules the descant to be raised.

In general, when the two parts are set in plain harmony, the descant ought to imitate, and not depart from that design. If otherwise a discord be introduced in the composition of the two plain parts, or a discordant note be brought in in the treble or air, the descant must take part of the discord.

This properly belongs to figured descant. Notwithstanding, it is an elegance common in practice, to throw in a discordant note in the variation, which is not in the plain song.

But these rules are addressed only to beginners.

Having done with plain descant, we shall here give an example of what hath been offered (p. 532. col. 1.) relating to the manner in which we would have the two basses set in composition of many parts; which is, That the part for the organ should move in long notes, and by the least intervals; the figures filling up the harmony and discord; while the part for the violoncello, moving by quicker notes, and greater intervals, becomes descant to the other basses.

The manner of setting the two basses depending on the principles of plain descant, and implying nothing more than what is contained in the last example, one instance of this will sufficiently answer our intention here.

Example of two basses in composition of many parts.

No. 68.

The variety will be still greater if this manner be pursu ed in figured descant. For as undoubtedly that is the best and most perfect composition where discord is intermixed; so there is no variety, which music is capable of, produced from the form or disposition of the parts, that will not receive improvement from the more perfect composition.
The last example therefore, and what hath been said of the two basses in plain descant, is meant as an introduction to a trial of the same in the more perfect, or figurate descant, both in the composition and performance.

Chap. III. Of FIGURATE DESCANT.

**Figurate descant** is the mixture of discord and concord, by notes of the same or different lengths or time, in the several parts.

Every interval in music which is not harmony, must be discord.

The discords therefore are six: namely, the lesser and greater 2d; the sharp 4th, or flat 6th; the lesser and greater 7th; and the 9th. The reason for repeating the 9th, which is the 8th to the 2d, shall be shown in its place.

The use of discord is twofold: To give a better air to every part of the music; and to create variety. For the discords standing in the natural order of the notes, between the concords, afford an easy passage of the same; and, at the same time, mix with, and bind the harmony.

Discords are introduced in composition several ways.

First, When the notes passing in the natural order, two, three, or more of one part are set against one of another part. This passage of the notes is said to be by diminution; as in the following example.

Example of discords in passage by diminution. No. 69.

When the treble descends, the discords descend likewise into the concords; that is, the 9ths pass into 8ths, the 7ths into 6ths, and so forth. The same thing happens when the bass ascends.

When the treble ascends, or the bass descends, the contrary happens; that is, the 2ds pass into 3ds, and the 7ths into 9ths, or the discords into concords, according to the natural numbers.

When a single discordant note is set, the change of that note into a concord is properly called the passage of the discord.

When the accompaniments are set along with the discords; that is, when the whole discord, either in composition of many parts, or in figures in the bass, is expressed, the change of the same into a concord is justly called the resolution of the discord. The passage of the discord in single notes moving according to the natural order, as in the last example, is evident.

The accompaniments and resolution of the whole discord depend on certain principles; on which we shall, in its place, demonstrate the same.

To proceed, then, on single discords.

The second way in which discords are used in composition is, when the notes of each part move alternately, a long note between two short ones, so that the note of one part breaks off and ends in the middle of the note of the other part. This is called syncopation or binding; for the frequent mixture of the discord here supports and binds the harmony:

As in this example. No. 70.

In this manner the air of either part is less constrained, by the constant return of the discord, and passage into the concord. In some places this happens by the natural suc-cession of the notes by diminution, as in the first example, though not so frequently as in the last manner by syncopation. But there is a passage of the discord into the concord, formed by the notes moving by greater intervals.

This music is preferable on account of the great variety produced by this unexpected, and, we may say, surprising mixture of the discord and harmony. For variety itself causes new pleasure, when it is least expected, or when attended by novelty.

This moving of the notes by greater intervals, is the third way of introducing discord; and is the effect of the discords and concords constantly meeting by contrary motion of the parts.

In this manner the variety arises from the passage into concords, different from those which must succeed, either in the natural order of the notes, or by syncopation.

The variety also is greater by the constant succession of discord and harmony almost through every note.

For here the composer is at liberty to pass into any concord he pleases; and to resume any discord. For as the passage into the perfect concords, between two parts, cannot be effected, but from the nearest discord, when the notes move in the natural order; so, when the notes move by greater intervals, there is opportunity for many passages, which could not take place in any other way.

All this will be evident, when we come to understand the resolution of the discords.

Example of the more perfect mixture of discord and harmony. No. 71.

In this example are set forth the two first ways of using discords; namely, by diminution and syncopation, as well as passing by greater intervals; being set according to the rules relative to each manner. Where the discord and harmony move by greater intervals, there the passage is from discords new and unpracticed in the other two.

The composition, where this liberty is taken, does most justly challenge the name of ornamental or figurate descant.

And the music, wherein the discord is used these three several ways in their turn, must be esteemed the best, as exhibiting greater variety than could be expressed the other ways only. Let it be remarked in this place, that this new passage of the discord is effected by both parts generally moving by a semitone; the power of which will be seen when we shall have demonstrated the accompaniments and resolutions of the whole discord.

There is a fourth way wherein discords are admitted in composition. This is when discords succeed each other; or, where there is no passage into a concord. This is setting discords note against note. It is to be done two ways. First, when the discord passes into one of another denomination, in the natural order of the notes, by contrary passage of the notes of each part, of the same or nearly equal quantity.

This passage of the discord is necessary, as we cannot ascend or descend by the degrees of a great interval; but the intermediate discords will take place, and thence oft-times two will succeed each other.
This liberty is to be used chiefly in short notes, and by diminution.

Example of discords succeeding each other, or set note against note. No. 72.

Secondly, Discords are admitted, note against note, when the same discord is often repeated. This liberty is taken with the discord of the flat 7th above all others; and is most justly practised in music of three parts. When this discord is brought in successively in two parts, the complement of the chord ought to be written in the treble.

Example of the discord of the flat 7th successively. No. 73.

This example is taken out of the eleventh sonata of Corelli's fourth opera.

In this example, it is, remarkable, that the first and second trebles furnish by turns the discord to the bass; which constantly descends by a 7th, while the intervals of the upper parts are 5ths and 4ths to the bass alternately. Observe, when the note in the bass is flat, the discord will be the sharp 7th.

The imitation of this passage may be learned by inspection of the example. The demonstration depends on the demonstration of the third resolution of the discords following; which we must therefore reserve for that place.

An example of this passage shall be given when we come to teach the use of discords in music of three parts.

Having done with the single discords and their passages, we proceed, in the next place, to the complex ones; by which are meant the same discords with their accompaniments and resolutions.

Now, as, by axiom the second of the theory, from the natural order of notes, the properties, proportions and relations of sounds, which arise out of their various combinations and succeffions, are deduced; we shall demonstrate the properties of the discords upon the same principle.

The first property of the discord is the notes which are to be played in the thorough bass, in concert with the discord. These notes are called the accompaniments.

On the exact knowledge of these depends the second property of the discord; namely, its passage into a succeeding concord.

This passage is called the resolution of the discord, as mentioned above.

Each discord hath its own distinct properties. Therefore the definition of discord already given is just; where it is said, that discord consists in certain variable proportions of the distance of sounds.

As two single notes standing at a certain interval, form the discord, so they may easily be resolved into the proper succeeding concord, as we have already shewn.

And on instruments which have not keys, no more than the two notes can well be performed. Yet, as the resolutions of the discords cannot be demonstrated without the knowledge of the accompaniments, we shall consider the whole discord together; and demonstrate the accompaniments of each particular discord, after the same method we have proved the harmony of each note of the octave in counterpoint.

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Theorem. Since every interval in music is discord or harmony, the accompaniments of most discords will be harmony in themselves; for thus they will be discord to the given note. But it will also happen, that some note of the accompaniment in other cases will also be harmony to the given note, yet the whole accompaniment discord in itself. For the soul so accords with harmony, as not to bear an entire perfect discord.

Now, as more or less of discord with the given note prevails; so the discords are naturally divided into proper and inharmonious.

A proper discord is the concord of some member of itself, and only discord in part with the bass or given note.

An inharmonic discord is an absolute discord in itself, and partly concord to the bass or given note.

There are five proper discords; namely, the lesser and greater 2d, the sharp 4th (or flat 5th), the sharp 7th, and the 9th.

There is one inharmonic discord; which is, the flat 7th.

It hath three places in the compass of the octave; where it appears in three different forms.

It is called inharmonic; not only because it is an absolute discord in itself, but also because it is not the accompaniment to the bass note, from whence the order of the discords is traced in the natural series; except in one place or form, which is the second; wherein the flat 7th is the uppermost note of the chord. This will be seen most clearly, when we shall have gone through the discords of each kind in their natural order, in the table of discord and harmony. No. 82.

We proceed therefore to the demonstration of the discords. And, according to the 2d axiom of the theory, shall begin with the demonstration of the accompaniments of the 2d.

As in the demonstration of the concords we begin with the key-note, which we considered as an immovable point, from whence our calculations were to proceed; so shall here consider the bass, or lower note of the discord, that immovable point; and the upper discordant note the interval in question, whose properties are to be found.

Demonstration of the accompaniments of the 2d.

The accompaniments of the 2d are the 4th and 6th to the bass or given note, or the discord of the 2d is the concord of the same.

The 2d is a proper discord: Therefore the accompaniments of the 2d are its 3d and 5th. But the 3d and 5th to the 2d, or discordant note, are to the given note the 4th and 6th; therefore, the accompaniments of the 2d are the 4th and 6th.

Example of the first discord, or discord of the 2d. No. 74.

Proper discord.

The discord of the 2d must be a proper discord: for the 3d and 5th to the bass with the 2d would be intolerable discord, seeing they are three notes in the natural order, and the 5th and 7th is the harmony of the 2d; therefore they must be the 6th and 8th, which is the given note in counterpoint.
given note: But the 6th will have the 4th; therefore the discord of the 2d is a proper discord.

By the 2d axiom of the theory, the properties, proportions and relation of sounds are deduced from the natural order of the same. Which axiom is extended to the discords, as they are combined of the natural notes, and differ from the concords only in form.

On this axiom, then, we are to investigate the next succeeding discord. The 2d discord is the 2d, 4th, and sharp 7th to the given note. For these are the next succeeding discordant notes.

**Demonstration of the second discord.**

The 2d and 4th cannot have the flat 7th; for they are harmony, or concord of the flat 7th; and the 5th is the given note: therefore it remains, that the second discord is the 2d, 4th, and sharp 7th to the given note. For these are the next succeeding discordant notes.

The 2d, 4th, and sharp 7th to the given note: therefore it remains, that the second discord is the 2d, 4th, and sharp 7th to the given note. For these are the next succeeding discordant notes.

**Inharmonic discord.**

This is an inharmonic discord; being an absolute discord in itself. It hath but one concordant note with the bafs; which is the 4th. This 4th is the flat 7th to the given note’s 5th: which 5th is the bafs to this discord; the given note in this place being considered only as a point, or unity, from which we are to investigate the next discordant notes, according to the 2d axiom.

The property of this inharmonic discord, or flat 7th, is, that it’s own discordant interval, or that which is formed by the accompaniment, is always a sharp 4th, or flat 5th, which distinguishes it at sight from every other discord. And every inharmonic, wherever found, hath the same property. The resolution also of every inharmonic is the same; as we shall see, when we come, in the next place, to shew the resolutions of the discords.

The next discord, according to the 2d axiom, is the sharp 3d, 5th, and flat 7th to the given note. This is also an inharmonic, or flat 7th; and having the same property with the former, namely, the flat 5th, must not be accounted a new discord. No. 76.

**Inharmonic discord.**

This is the inharmonic discord in that form, whose accompaniments are relative to the bafs, or given note. The third discord is the 3d, 5th, and sharp 7th to the bafs, or given note.

**Demonstration of the third discord.**

The sharp 3d, 5th, and sharp 7th must constitute the next discord. For the flat 3d, 5th, and flat 7th, are harmony, or concord of the flat 3d; and the 8th with the 3d and 5th, are the chord of the bafs note; and the flat 7th, with the sharp 3d and 5th, are the inharmonic flat mentioned; therefore, the sharp 3d, 5th, and sharp 7th, are the 3d discord.

Example of the third discord. No. 77.

**Proper discord.**

This is a proper discord, being the concord of the 3d to the bafs; and the sharp 7th the discordant note.

To proceed then according to our 2d axiom, the next discordant notes in order, are the 4th, 6th, and 9th: But these being the notes which constitute the first discord, varying only in place and name of the 9th, for the 2d, are in effect the same discord.

The next successive discordant notes are, according to our well known axiom, the 4th, sharp 7th, and 9th. But these likewise constitute the 2d discord in like manner, as was said in the former case; and therefore cannot be reckoned a new discord.

To proceed then by our axiom: The next ascending notes, by the smallest intervals, are the sharp 4th, 6th, and 8th. This is an inharmonic, or flat 7th; its flat 7th being formed by the sharp 4th and 8th; therefore no new discord. No. 78.

To go on, the next discordant notes will be found the sharp 4th, 6th, and 9th.

**Demonstration of the fourth discord.**

From the proof of the last inharmonic discord, the sharp 4th and 6th can form a proper discord with no other interval but the 9th; for the 7th would produce three notes in the natural order, and intolerable discord. Therefore the fourth discord is the sharp 4th, 6th, and 9th.

Example of the fourth discord. No. 79.

This is a proper discord, being a concord in itself, and only discordant to the bafs note. The discordant notes of it are the sharp 4th and 9th.

The next which presents itself, is the 5th, sharp 7th, and 9th, by the same axiom.

**Demonstration of the fifth discord.**

The 5th will admit no other discordant notes but the sharp 7th and 9th. For the 8th and 10th make the concord of the bafs note; and the sharp 7th and 10th is, with the 5th, the third discord already proved; and any other note would be double discord, and intolerable: therefore, the fifth discord is the 5th, sharp 7th, and 9th.

Example of the fifth discord. No. 80.

**Proper discord.**

This is a proper discord, being a concord in itself; and discordant only with the given note. Its discordant notes are the 7th and 9th.

We have purposely reserved the discord of the lesser 2d to the sixth and last place, 1st. Because, as the interval next above the key is always a whole tone, we cannot, according to our 2d axiom, erect this discord as relative to the given note, or key; as we have done the others. Now, the resolution of this discord will be found different from that of the greater second; for reasons which will abundantly appear, when we speak of the resolutions. This discord may properly be called the discord of the semitone.

**Demonstration of the discord of the semitone.**

The discord of the semitone, or lesser 2d, is, like that of the greater 2d, or whole tone, the 2d, 4th, and 6th. The demonstration is the same as that of the greater 2d, and therefore need not be repeated here.

Example of the sixth discord. No. 81.

This is a proper discord, like that of the greater 2d, being
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being a concord in itself. Its note discordant with the bafs is the 2d.

It hath been faid, that all harmony is divided between the flat and sharp keys.

The mixture of discord and harmony enables us to extend the like observation in this place much further.

Hence the following corollary.

The composition of all musick, of any number of parts whatever, is divided between the harmony of the flat and sharp keys, and the joint mixture of discord with it.

To illustrate these truths, we shall set in one view every concord and discord, in the whole compass of musick, in their natural order. No. 82.

Hence we shall derive some useful corollaries, which will lead us to discover what is next to be considered, the second property of the discords, or their resolutions into the concords.

The manner of reading this is as follows:

This concord is the concord of the key.

This concord is the concord of the 2d to the key, or given-note.

This concord is the concord of the flat 7th.

This discord is inharmonic, and so forth: descending still from the uppermost lines of harmony, or discord, to the lowest line, or bafs.

In this view is seen the mixture of discord with harmony, each in the natural order. Wherein, indeed, nothing regular or proportioned appears to sight. The reason of this is evident from the demonstration of the harmonic proportions. For, if they be of a species different from all other proportions, as by corollary 2d of the theory, and must be demonstrated on principles peculiar to them; then the succession of the discords, constantly taking place between the intervals of harmony, must be disportioned too. This appears to sight in the next example, or view of harmony and discord in the natural order. No. 82.

However irregular this may seem, an uniformity prevails through the whole, which supports that variety in musick so deplorable: Without which variety, there could have been but one concord among sounds; a sameness prevailing through the whole; without semitone, and consequently without discord. In this case, musick never could have existed as an object of pleasure to the sense; much les of science.

This admirable structure is raised on the power and property of the semitone, which shall be the subject of the following corollaries.

Cor. I. Every semitone in the octave hath either a concord or discord proper and peculiar to itself. Yet, the natural succession of the concords and discords is not according to the ascending and descending semitones. For, it is evident, in the annexed table, that the corresponding bafs notes constantly descend by 3ds, the variety, at the same time, flowing throughout the harmony and discord in the upper parts, ascending by semitones. Yet the bafs expreffes every semitone in its passage by 3ds, uniformly to its period.

This most strongly illustrates the truth of the 4th axiom of the theory; namely, that the concords and discords, either in their natural order, or arranged by art, will not suffer us to depart from the established precept of variety amid uniformity.

The same uniformity, or rather unity, is exhibited still more plainly in the 5th discord, in the coincidence of discord and harmony in the same individual sounds.

For this discord, which is the discord of the 9th, is also the harmony of the 5th.

This is truly admirable, and furnishes us with the most interesting remark in the compass of musick, as in the following corollary.

Cor. II. The scope of musick, and motion of the parts, must at length terminate, and meet in one invariable thing Harmony.

Thus are we arrived at the full extent, or bounds of musick. It is fit we now return to make such further observations as will lead us to the knowledge of the resolutions of the discords, which is the next thing to be spoken to.

The division of discords into proper and inharmonic, we have made for the sake of clearness and method. The difference already pointed out between the discords must be remembered; which is, that the property of the inharmonic, or flat 7th, (which note does ever, with another note of the chord, frame the sharp 4th, or flat 5th) is the same, in whatever place or form it is met with; whereas the proper discords essentially differ from each other, and in every particular.

The three inharmonic therefore, in the natural order of the discords, are not so properly three, as the same discord in different light; where it is a preparation for a close on the key, and on the 4th and 5th to the key.

The bafs to the discords moves by 3ds descending in a sharp key.

The notes of the bafs, corresponding to the proportions of the flat key, have no relation to the discords in the line next above; but are the bafs to the concords in the flat key, as demonstrated in the rules of harmony.

The two discords, which are a repetition of the 1st and second, are set down in compliance with the 2d axiom, to pursue the natural order. And hence they serve to demonstrate there can be no other discord than those exemplified in the scheme. For there is no semitone in the octave which doth not appear there to have its discord or harmony connected with it.

In this scheme then is comprised every interval of musick, with the members of each chord respectively, both discord and harmony, in the natural order.

From the same order, we shall demonstrate the passage of the discords, into the concords or resolutions of the same.

In the theory, it hath been said, that the semitone is the principle or hinge, on which turns the resolution of every discord.

On this principle, then, we shall now demonstrate the same.

The discords stand in the natural order between the concords; but every note of the chord is not equally nearrespectively.

From the idea of harmony, which is fitness or proportion,
tion, the passage of the discord must be to the nearest 
cord; therefore, the resolution will be by the smallest 
interval, that is, by the semitone.

This is the general theorem for the resolution of every 
cord. We will now apply it,

The resolution of the discord of the 2d is into the 
cord of the given note.

The 4th, or semitone, will move into the 3d, but the 3d 
will have for harmony its 3d; therefore, the 6th must descend 
into the 5th, and the 2d's passage by the nearest interval 
will be into the given note. By these passages is formed 
the chord of the same; therefore, the resolution of the 
cord of the 2d is into the concord of the given note.

In a flat key, there are two passages by semitones; that 
of the flat 6th into the 5th, and of the 2d ascending, by 
contrary motion, into the 3d.

Example of the resolution of the discord of the 2d, or 
first discord. No. 83.

Proper discord.

The resolution of this discord being into the given note, 
the bass does not move.

The resolution of the second discord is into the concord 
of the given note.

The second discord is the 2d, 4th, and sharp 7th. The 
sharp 7th and 4th move by the semitones and contrary 
motion into the 8th and 3d, while the 2d falls a 5th into 
the 5th. These are the concord of the given note; there-
fore, the resolution of this discord is into the concord of 
the given note.

Example of the resolution of the second discord being 
inharmonic. No. 84.

Inharmonic discord.

The resolution of this discord being into the concord 
of the given note, the bass ascends by a semitone.

The passage of this inharmonic by contrary motion of 
two semitones, and the other note falling a 5th, is the 
resolution of every inharmonic, where ever introduced. 
This therefore needs no repetition. But if the succeeding 
cord has a flat 3d, the passage is by two ascending fe-
mitone's; the 2d rising into the 3d, the 7th into the 8th, 
and the 4th by a whole tone into the 5th. This move-
ment can only happen in the resolution into the key.

The other, of much more extensive use, is the true re-
solution of the inharmonic discord; and more intereting, 
as, by its contrary motion of the semitones, it better binds 
the harmony.

It is necessary here to explain further the nature of the 
inharmonic discord.

The inharmonic discord, then, is always the chord in a 
sharp 3d, with a flat 7th; which two notes frame the in-
terval which characterizes this chord, namely, the sharp 
4th, or flat 5th: when the flat 7th is the upper note of 
the two, the interval is the flat 5th; when the sharp 3d 
is the upper note, the same interval is called the sharp 
4th. These notes being relative to the fundamental note 
either of them determine the 'chord.'

As the inharmonic is found in different places of the 
 octave, so consequently the note of the chord must vary 
accordingly; the second inharmonic therefore only, in the 
natural order, hath reference to the given note in the 
table, as that happens to be the note of the chord. For 
the given note there is to be accounted 'only a point or 
unity, from whence we proceeded to trace the discords in 
their natural order, as they lie between the concords.

The chord note, therefore, of the first inharmonic is the 
5th to the given note; and of the last inharmonic, it is 
the 2d to the same. Now, as the whole chord falls a 
5th in the resolution, so the first is a preparation for 
a close on the key, the second for a close on the 4th, and 
the last for a close on the 5th; now, as any note of the 
chord may stand in the bass, so the third is often prefer-
bred before the chord note, for the sake of the movement 
of the bass by a semitone, as well as because falling a 5th in 
the bass is more properly the part of harmony.

The flat 7th is likewise chosen for the bass note; for 
the same reason, the movement of the bass by a semitone 
defending, which is no incon siderable use of discords. 
For in figurate descent, as we have said, all the parts 
move more freely.

The next discord is likewise inharmonic. It is the sharp 
3d, 5th, and flat 7th to the given note; which note is like-
wise that of the chord. No. 85.

Note, the resolution of every inharmonic being into 
its 5th below the chord, the resolution of this will be 
into the 4th of the given note; as rising a 4th, and fall-
ing a 5th, answers the same thing in estimating the inter-
vals of harmony.

Inharmonic discord.

Example of the second inharmonic discord and its re-
solution: here the bass note is the note of the chord; 
therefore, in the resolution it falls a 5th, which is the 4th 
to the given note.

The flat 7th descends by a semitone into the 3d, the 
3d rises by a semitone into the 8th, and the 5th falls a 
5th into the 5th of the concord. The resolution therefore 
is into the 4th of the key.

This is that form of the inharmonic discord on which 
the composition of the passage taken out of Corelli, (No. 
73.) is grounded. Observe, that in the cited passage, 
and also in every like passage, the two notes of the bass 
move to only one note of the second part, which becomes 
the flat 7th by this movement of the bass.

Thus the flat 7th is given, in the upper parts by 
turns, to every note in the bass, as hath been before re-
marked.

Resolution of the third discord.

The third discord is the 3d, 5th, and sharp 7th, to 
the given note; it is resolved into the 6th to the same. 
For the 7th ascends into the 8th or 6th's 3d, the 5th rises 
a whole tone into the 6th, and the 3d not moving becomes 
the 5th. The resolution of this discord therefore is into 
the chord of the 6th.

Example of the resolution of the third discord. 
No. 86.

Proper discord.

This is a proper discord; in the resolution of which 
the bass falls a 3d, while the whole discord falls a 5th.

The
The next discord is the sharp 4th, 6th, and 8th. It is inharmonic. Its resolution is into the chord of the given note's 5th. No. 87.

**Resolution of the third inharmonic discord.**

Of this discord the bass note is the flat 7th; it descends by a semitone, while the whole-chord falls a 5th.

**Inharmonic discord.**

Its resolution is the same as that of every inharmonic, in what form ever, by the contrary motion of the two semitones, while the third note falls a 5th.

**Resolution of the fourth discord.**

The fourth discord is the sharp 4th, 6th, and 9th. Its resolution is likewise into the chord of the note's 5th.

For the sharp 4th ascends into the succeeding concord's 8th, the 6th passes into the 3d, and the 9th not moving becomes the 5th. There are the chord of the note's 5th.

Example of the resolution of the fourth discord. No. 88.

**Proper discord.**

This discord is a mixture of the proper and inharmonic. It is a proper discord, for that the notes of the treble are concord; and inharmonic, in respect of the bass, with which it makes the discord of the sharp 4th.

It differs from the foregoing, where the flat 7th is expressed in both treble and bass; whereas, in this, it is only in the bass.

The bass here also descends by a semitone, while the chord falls a 5th.

**Resolution of the fifth discord.**

The fifth discord is the 5th, sharp 7th, and 9th. It is resolved into the concord of the bass note.

For the 5th is that note's 5th; the sharp 7th ascends by a semitone into the 8th; and the 9th (or 2d) passes into the 3d. Thus it is resolved into the chord of the given, or bass note.

Example of the resolution of the fifth discord. No. 89.

**Proper discord.**

In this resolution the whole chord falls a 5th, while the bass stands still, or descends into the octave.

This is plainly the last discord in the order of sounds. Its resolution is into the given note or key, by the passage of the great cadence, or descent by a 5th. It is a concord in itself; and is in harmony the concord of the 5th.

In this discord concord and harmony are united. When it stands in discord with the bass, the bass doth not move in the resolution; when it stands perfect harmony with the bass, then the bass descends a 5th.

Therefore, we conclude, Harmony and discord are like two finite lines, whose beginnings are at a certain distance; and in the natural progression converge constantly, until they meet in a point.

The discord, which we here referred to the sixth place, is that of the lesser 2d, or semitone.

Its places in a flat key are the 3d and 6th; and in a sharp key the 4th and 8th, or where ever a new semitone is introduced.

It is a proper discord, being a concord in itself, whole-chord hath always a sharp 3d.

Its properties are everywhere alike; but its resolution differs from that of the greater 2d, for the reason assigned in the resolution of every discord; that is, the passage by the semitone.

**Resolution of the lesser 2d, or semitone.**

The discord of the lesser 2d is the 2d, 4th, and 6th to the bass; or, the concord of itself.

Its resolution is into the concord of its own 3d or 5th. It rises into the concord of its 3d by the single passage of the semitone descending. And into the concord of its 5th by the 4th descending along with the semitone.

Example of the resolution of the discord of the semitone. No. 90.

In the first resolution, the chord rises a 3d, and the bass falls a 5th. In the second, the chord rises a 5th, and the bass falls a 3d, the reverse of the former.

From the resolutions of the discords, we derive the following corollaries.

**Cor. I.** There is no interval of harmony that is performed by the bass in the resolution of one discord or another.

Hence we may conceive that harmony regulates even the discords, and prefigures in every part of music.

**Cor. II.** The inharmonic discord, or flat 7th, is a preparation to a close on a key, the 4th and 5th, flat 3d and flat 6th; for into the harmony of these it is resolved; they being the intervals on which closes may be made according to the established rules of melody. And universally, wherefore a close may be made by introducing a new semitone, the preparation may be made by the flat 7th, or inharmonic discord.

This discord, being of such extensive use, will deserve some further remarks, which may render the setting of the same more easy, and assist the performer in the taking and resolution of it.

In the inharmonic discord, then, are three notes chiefly concerned, which are the note of the concord; its 3d, (which is always sharp;) and the flat 7th: either of these may be set in the bass. Hence there will arise three varieties.

If the note of the chord be the bass note, the figure is the flat 7th; the chord is that of the same note; and the bass falls a 5th.

Secondly, When the 3d is the bass note, the figures are flat 5th and 6th; the chord is that of the 6th to the same 3d; and the bass ascends by a semitone.

Thirdly, If the flat 7th stand in the bass, the figures are the sharp 4th, 6th, and 9th; the chord is that of the 3d to the bass note; and the bass descends by a semitone.

**Example.** No. 91.

The 5th of the chord may likewise stand in the bass; but as the movement of the same is by a whole tone descending, it is very seldom used.

The figures are sharp 6th.

The figures are flat 3d.
Cor. III. Hence the bass ascending or descending by a semitone, furnishes an opportunity of introducing notes in the upper parts, which will constitute the inharmonic discord.

And again, the sharp 3d of any chord in the treble, or any note having the addition of a sharp, and thereby becoming the greater 7th, may be the 3d of an inharmonic; the bass taking the flat 7th. For the sharp 3d of the chord, (which is the sharp 4th to the flat 7th in the bass, or elsewhere,) and the flat 7th, in whatever part they are fat, in bass or treble, or both in the treble, constantly move each his own way; the first ascending, and the latter descending by a semitone.

These are the simple disords as they are found to lie in the natural order of sounds between the concords; whose accompaniments are, for the most part, harmony among themselves. It is evident, from the method in which we traced them, that there is no other discord among sounds. Notwithstanding, from the combination of two simple disords, a new form of discord may be framed, which taketh part of the inharmonic and discord of the semitone; which, therefore, we call the compound discord.

This discord is the sharp 3d, flat 7th, and flat 6th, or semitone to any note whose chord hath a sharp 3d.

It is resolved, by the passage of three semitones, two descending, and one ascending, into any concord with a sharp 3d; and therefore may be introduced as a preparation to any concord, in either flat or sharp key, where the greater 3d is.

Example of the compound discord, and its resolution. No. 92.

The resolution of this discord, as it is compounded of the disords of the flat 7th, and semitone, will partake of the resolution of the same. Thus the upper note, or semitone, descends into the 5th of the concord; and the flat 7th and 3d meet by contrary passage of a semitone each into the 3d and 8th part of the resolution of every inharmonic, while the bass descends a 5th. Thus the passage into every note of the concord is by a semitone; so great a favourite of nature is the semitone.

By changing the form of this discord, it will be resolved into a chord with a flat 3d, by one semitone descending, and two ascending; the two extreme notes of which are the same as in the example above; but the middle note is the 5th ascending into the 3d, instead of the flat 7th descending. The upper notes therefore form the flat 5th, or inharmonic interval. No. 93.

The properties of those discordant notes of the semitones are, in musick of two parts, a preparation to, or pafs by contrary motion of the semitones into the concords of the sharp 3d, flat 6th, and 5th. When the flat 7th is the uppermost note, and the lower the sharp 3d, they pass into a sharp 3d.

When the upper note is the sharp 3d, and the flat 7th is below, they pass into the flat 6th; so do likewise the flat 7th above, and the chord note below.

Lastly, the two extreme notes of the compound discord pass into the concord of the 5th.

I C K.

Example of the passage of disords in musick of two parts. No. 94.

In like manner there is a passage into the octave from a discordant interval; the upper note of which is part of a concord, and the lower the semitone of the compound discord. No. 95. Or the contrary.

There is no passage by two semitones into the flat 3d and sharp 6th from any discordant interval, except the semitone. For, in the passage of quick notes encountering each other by contrary motion, this, or any other discordant interval, may fall into the concords. But such, being tolerated only for their quickness, need not be reduced, as indeed they cannot, to any rules of art.

Lastly, the bass will admit two notes together, each concording with it, namely, the 5th and 6th, and making a discord between themselves.

This discord, which differs from the proper and inharmonic, is rightly called the mixed discord; each of the two notes being in harmony with the bass, and discordant to each other.

The framing of this discord depends upon the rules of harmony, and may be let to any note of the bass which hath for harmony its own concord, and is likewise the member of another.

Therefore, in the sharp key, the key and 5th, and in the flat key, the key 3d, 5th, and flat 7th, admit a 5th and 6th.

When we shall have proved, under the article of transposition, the 5th in a flat key, and 6th in a sharp key, to have their own concord; they will be found, no doubt, to have the privilege of admitting a 5th and 6th.

For thus it is understood. The key hath a 5th in its own right, and a 6th as member of the 4th.

The 5th hath a 5th in its own right, and a 6th as member of the key.

The flat 3d hath a 5th in his own right, and a 6th as member of the key.

The flat 7th hath a 5th in his own right, and a 6th as member of the 3d.

Thus the 5th and 6th will stand together to the bass.

The properties of sounds in the natural order may be transferred by art, and improved into all the variety possible; as this is no other than an imitation of nature.

Hence we infer, that every note, which assumes the nature of the key, by the addition of the greater 7th, will admit a 5th and 6th.

This 5th is easily distinguished from the 5th of the inharmonic, which is always an imperfect one, and ought constantly to have a flat prefixed.

Now the chord of the inharmonic with a flat 5th is that of the 6th to the bass note, as hath been said. But the chord of the mixt discord may be better understood to be the chord of the bass note, with a 6th added.

Sect. 2. Of Figuring the Bass.

Having delivered all that hath fallen under our observation concerning the nature, proportion, and use of discord; we shall now make an application of the same, in order to explain the figuring of the bass; the next article proposed to be spoken to.

First, Of figuring the concords.
That the notes whose harmony is their own chords, need no figures, is evident from the definition of harmony; which consists of one certain, invariable proportion of sounds.

These are the key, flat 3d, 4th of a sharp key, 5th, flat 6th, flat 7th.

They which, as members of other chords, require the figures of harmony set over them, are these following; and are reduced to this general rule:

The 3d of every concord hath a \( \frac{5}{4} \); and the 5th of every concord hath a \( \frac{6}{5} \).

Therefore, \( \begin{align*} \text{Key} & \quad \text{5th of a flat key} & \quad \text{5th of a sharp key} \\ \\
\text{Flat 3d and sharp} & \quad \text{have a} & \quad \text{have a} \\ & \frac{5}{4} & \frac{5}{2} \\ \text{Flat 6th and sharp} & \frac{6}{5} & \frac{6}{5} \\
\end{align*} \)

Sharp 7th

Lastly, The 4th in a flat key, when it has its own chord, must have a 5th set over it, to distinguish the chord from that of the flat 7th. And the 6th in the sharp key, when it hath its own chord, must have a 5th likewise set over it, to distinguish the chord from that of the 7th.

The proof of the 6th in a sharp key, having for harmony its own concord, depends on the relative proportion of the flat and sharp keys; as will be shown in the chapter on transposition. So much for figuring the bas in concords.

Let us now inquire into the shortest and clearest method of figuring the discords. This will be no difficult matter, when we consider well the whole discords, as they are all figured in every example.

There the figures set over the bas express the intervals which the notes in the upper parts form with them. These taken together make the whole discord. And as these, with the harmonic chords in succession, express the whole composition, they are therefore called the thorough-bas.

To render the performance of the thorough-bas easy and expeditious being the chief intention of figuring the bas; this will be best answered by distinguishing the discords, which have some figures in common with each other, by such figures only as will strongly mark each discord. For though all the figures set down in the examples be necessary to demonstrate the properties of the discords, and truth of the composition; the bas is quite otherwise in respect to the sight; many marks causing perplexity and confusion, when one single mark in this, as in all other cases, best discovers the difference. The proper discords then being concords in themselves, the figure, or figures, discordant with the bas note, will distinguish each of these.

The inharmonic discords being the same in different form, will be distinguished by the discordant figures peculiar to each form.

Of the properties of this discord, and manner of taking the bas, we have spoken sufficiently. We shall therefore only set down the discordant figures of each form, in the following example.

Example of the proper discords figured for taking the bas at sight. No. 96.
Music is the air of the uppermost or first part in music, commonly called the tune.

In a plain song, the air is formed without considering the relation which the other parts, which may be set in composition with it, may bear. For, being first framed, and for the sole end of pleasing the ear and fancy; it must, it is evident, be independent of them.

For as to framing the bass first, and setting the treble to it, there appears no necessity either in reason or the rules of composition, they equally serving the purpose of beginning with any part, no part being privileged with any particular member of discord or harmony; as is abundantly manifest from the various positions which the discordant notes have been shown to stand in; as well as from the 4th axiom of the theory, which establishes variety for conducting and rendering even harmony acceptable; a sameness in the successive concords being the only thing exceptionable in that part of composition.

All the parts of music then being equally concerned in the composition; to prefer any one part, as a bass, or unerring guide, on which to erect the music, or bring in the parts, is doing injury to that liberty which nature and the rules of art put us in possession of.

But the air of the first part is essential to the tune, or rather the tune itself, compels us to decide in favour of framing the treble first. In which it will be found impossible to succeed, when it is confined to what the bass, if it be first framed, must of necessity prescribe.

This preference in framing the treble first, chiefly respects a plain song, or air. For, in more elaborate pieces, where the design of the author is imitation of passages in the several parts by turns, according to his choice or fancy making use of the fame liberty, he will take any for the leading part, and accordingly write the passage in that part, and finish the composition in the rest.

The air or first part in instrumental music is called the first treble; the air for a single voice is called the voice part, or song; and in music for many voices, the upper part is called the counter-tenor.

In this music, the air of the tenor, and of every part performed by the voice, is studied with more exactness than the inward parts of instrumental music.

The reason for this difference is, that in instrumental music, the first violin generally predominates, or leads the music by its air; as this is the composer's design, the other parts must of necessity be accommodated to it.

Whereas in music for voices, every voice repeating the same words, that is, expressing the same sense, at the same time, or immediately succeeding; nothing can defeat the end of the music so much, which is the setting of words, or rather sentiments, to notes as expressive of the sense as inarticulate sounds can possibly do, as for one part to excel the others so much in this necessary point, as by comparison to depreciate, weaken, or alter the sense in the others.

The air, therefore, of every part in vocal music must be consulted; not only for the sake of harmony, (for a good air in each part improves even the harmony;) but also for the sentiment sake, without which the music must be absurd and disjointed.

Notwithstanding the liberty which everyone may justly challenge of framing an air agreeable to his own fancy; yet it cannot be said, that this liberty is uncontrollable, or beyond the power of art to prescribe bounds to: For then indeed every strain composed by even a bad and injudicious ear might stand in competition with the most finished pieces. But as this will not be allowed on any hand, even an undistinguishing ear conceiving a degree of pleasure in hearing good music; so there is no doubt but that there must be some precept or manner found out by experience, to ascertain and conduct the air or strain, and which will render it to a good and judicious ear plainly preferable.

The rules therefore which we shall lay down for melody, are such only as are founded in truth and reason; the result of experience, joined to skill; and which are admitted in every liberal art: These are unity, imitation, and order. If it shall be said, that persons unskilled in music, but otherwise very capable from a natural good ear, will sing an air which an artist cannot find fault with, we confefs it may be in some fort true.

But the strains of such composers are always very short; and as they seldom or never depart from the key, so they afford not that variety so definable in music: Nay, what is this but saying that the rules of art are conclusions taken from nature, as in truth they are; so then they must be asserted or right? This must be so, when the appeal is made from art to nature.

As to those essays called voluntaries, there was never a good one performed but by a good master. The music was always good in proportion to the master's skill in the art; in proportion to the variety he introduced according to the rules of art. Therefore even voluntaries are the effects of knowledge and deliberation.

But to return. The first rule of melody is unity.

The unity of tone is said to be in respect of the key, and of the subject.

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bars, be they more or less, as it shall happen; every
tune being framed with some prevailing idea or fancy
peculiar to itself, and therefore distinguishing it from
every other.

The subjects of grand pieces of instrumental musick
are contrived with care and study; and invented with design
to enlarge or descant upon at will; not being confined to
any length, or certain number of bars. Such pieces, be-
ing the efforts of great and masterly genius, afford all the
pleasure that design and invention, carried on by every ma-
terly stroke of art, can give.

The second rule of melody is imitation. As in the
executing other arts, a similitude and proportion of the
members ought to be preferred; so imitation, or a re-
petition of the most striking passages, answers to this in
musick.

Imitation may be performed many ways. First, when
the repetition of the passage is made, beginning on the
note above the leading note of the passage; or on the
third, fifth, eighth, or any other interval.

A passage also may be imitated in any of the desce-
ding notes. A repetition on the octave below is frequent in
every good author.

In the repetition of passages, there are two varieties.
The first is, when the passage is repeated in notes be-
longing to the harmony of the key. It will seldom hap-
pen in this case, that the passage will in the repetition be
precisely the same, in respect of the intervals of the notes,
though the movement be an exact imitation.

The reason of this will be evident, if we consider that
the intervals in both flat and sharp keys respectively af-
cend by different degrees; the semitone changing the in-
tervals almost continually.

See example, No. 12, in the theory.

In these examples no more than two flat or sharp thirds
succeed each other. And where they do succeed, the
semitone is in a different place in the two like intervals
of flat thirds; it being the third of one interval, and 2d
of the next ascending 3d, or the contrary.

In the sharp key, two sharp 3ds ascend from the 4th
and 5th, and in the flat key from the 6th and 7th. The
iniquity of the 5ths, and of the few instances of their suc-
cession, is owing to the places of the semitones.

To the inequality of the 3ds is owing the inequality of
the 4ths, 5ths, and every other unequal interval in the
course of the notes; the greater necessity of partaking
of the inequality of the latter, which is included in it.

All this is evident.

Therefore, the repetition of a passage will not be pre-
cisely as the passage, except in the places above-mention-
ed; that is to say, a repetition of sharp thirds from the
4th and 5th of the sharp key; and of the same, on the
6th and 7th of the flat key. And in the sharp key,
there may be an imitation in the compass of six notes af-
cending; namely, from the key, and its 5th. We have
been particular in remarking the want of exactness in
imitation on notes belonging to the key. Not that we
mean to mark it as a defect; for it is beyond doubt, that
every passage in the harmony of the key must be pleasing,
whether it be a perfect imitation or not.

Besides, this dissimilitude, arising from the place of

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the semitone being changed, is so far from being charge-
able with a defect, that, as hath been often said, it pro-
duces that sweet variety which is founded in the principles,
and which every artist pursuing will succeed in; as in this
he doth no other than copy after nature.

These remarks on the imitation of a passage in the notes
of the harmony of the key, will lead us to the second
manner of imitation; which is such, as that every note
in the repetition stands exactly in the same interval re-
spectively as the notes of the first passage.

This then is a perfect imitation. Which, as it cannot
take place in the harmony of the key, except in the few
cases abovementioned, it must be effected by art; that
is, by altering the places of the semitones in the key, so
as to correspond with those in the original passage, by
marking a sharp for the semitone ascending, if the repe-
tition be in notes above the passage; and a flat for the
semitone removed lower, if the repetition be in the de-
cending notes.

In this manner there can be a perfect imitation of any
passage of any length whatsoever, and of any compass:
in every instance of which, the key is changed, by in-
roducing notes not belonging to the harmony of the

As every interval of the first passage must be preferred
in the repetition: it will sometimes happen, that many flats,
or sharps, must be added to the notes in the repetition. The
rule of this practice will be well understood, when we
shall have learned the art of transposition; the repeti-
tion of any passage in this manner being no other than a
transposition of the fame into another key. In regard to
this perfect imitation, we have one remark: which is,
that if a repetition be made on the note next above, and
repeated again the note still higher, it will have a good
effect; for this will create such a novelty in the strain as
is surprising; besides that it affords the author an op-
portunity both of making new descant or enlarging on the
subject in this new key, as well as of shewing the greatest
skill by returning from that digression into the original
key with art and propriety.

This will be no difficult matter to one who understands
well the art of transposition. Now, the repetition of the
subject transposed into a key different from the original
belongs to this second rule of melody; as the repeating
the subject in its own key respects the rule of unity.

The repetition of the subject after these two manners,
and throughout the several parts, as treble, bass, tenor,
and so on successively and constantly, each part taking
it up immediately, or as soon as the repetition is finis-
hed in another, whereby the several parts seem to move in pur-
fuit of each other, is called a fugue.

Musick composed on this design is justly esteemed a-
bove all other, not only on account of its excellent con-
trivance, but for the sake of the pleasure also which it
affords.

In a just fugue is represented all the variety possible;
at the same time that an uniform progression of the parts
is preferred throughout the whole, without the least dif-
covety of the figures of art.

The reason for this may be, that the repetition of so
interesting a passage as the subject is, is so natural to the
imagination
The subject being first written in that part which the composer intends to be the leading part, the same must be set down again in the next part wherein the repetition is appointed to be made, either in unison, or on the 4th or 5th to the key or subject; the 2d, or any other interval; in which matter the composer is at liberty.

Yet the repetition on the 4th seems more natural to the flat key; as, on the 5th, it is to the sharp key.

If the music be in two parts only, the subject being written in each part in succession; the next step will be to frame descant to that part where the repetition is, and which therefore will be written in the leading part. Henceforward the parts move on at liberty, that is, nowhere repeating the subject, but expressing all the variety in descant each to the other, which the fancy, invention, and skill of the author suggest, until the subject is again repeated, either in the key, or some interval of the harmony of the key, or perhaps in a new key.

The imitation of this must immediately follow in the other part, in unison, or otherwise.

If the music be of three or four parts, let the subject be first written in every part, in succession; and in the order you intend. Then fill up with descant the second bar, or more, of the leading part; that is, as far as the subject reaches in the other part; and proceed likewise on the next repeating part with other new descant; and so on through every part, until all the spaces are equally full.

After which the parts go at liberty, as before in a two-part fugue, until another repetition of the subject.

But where, or how frequent, the repetition of the subject may be made; or on what interval, whether above or below; or by what succession of the parts, (for they need not preserve the order they began in;) is neither the business, nor in the compass of the rules of art to prescribe.

In these matters, the composer is as much at liberty as his genius and invention can furnish matter and variety. So that in some places the subject may be repeatedly, continually, in the different parts, on intervals and in a key different from the original key or order.

Sometimes, the movement of the subject being the same, the notes are changed from ascending to descending, or the contrary. Sometimes even the movement to the contrary. At other times, a new subject is introduced; and then it is called a double fugue. And lastly, for the sake of variety, the subject is repeated backwards, or inverted; so that the parts seem to pass each other by contrary motion, instead of paring.

In a word, there is no passage which expresses variety, which may not be introduced in a just fugue; while the uniformity is preferred in the imitation of the same, and retaining the original subject, and key, towards the conclusion or close of the piece.

We shall only add, that if the descant which fills up the bars be constantly written in all the parts successively and in order throughout the whole piece, the fugue is, from the exactness of this repetition, called a canon. In framing of which, observe, that if the canon consist of three or more parts; when the third part takes up the subject, the descant in the leading part must be part of the harmony of the other two.

What remains to be spoken to on this second rule of melody, or imitation, is the method of returning into the original key, after a passage in a remote one. This will lead us to consider the half-tones not belonging to the harmony of the key, or chromatic notes.

For if a passage, or repetition of a passage, be in a new key, which is the imitation we are now speaking of, the returning the key immediately will be by chromatic notes; descending if the repetition were above; and if the repetition was in notes below the passage, we may ascend into the key by chromatics likewise, or half-tones ascending.

This is evident. For every key, flat or sharp, having its semitones in their proper places, a passage is not in the key, when the semitones are out of their places.

Therefore the returning into the key, from a passage not in the harmony of the same, must be by removing the new half-tones.

This depends on the knowledge of transposition.

The new semitones introduced in a passage, or imitation of one, we have called chromatic notes; because every semitone not belonging to the harmony of the key are to be found only in the chromatic scale.

Yet this is but improperly. For two, three, or more semitones succeeding each other are properly called chromatic notes; which, to music wherein the frequent use of these is made, gives the name of chromatic music.

The use of chromatic notes is to raise the attention by the uncommon and unexpected variety they produce.

For every new half-tone ascending, being understood by the ear as the greater yth, implies a new key. Three or more semitones ascending after each other, do therefore raise the expectation of so many new keys: whereby the curiosity is greatly excited; and the expectation of the ear being gratified, in the imitation of a close, by every new semitone, the music becomes, as in all other cases where novelty takes place, truly the object of admiration. In a series of semitones ascending, the last is in the place of the key. When chromatic notes descend, the last but one is the key, for the same reason; namely, the semitone below founding as the greater 7th, every key being a semitone to its greater 7th or half-tone below relatively.

Chromatic notes ascending, by alarming the ear and imagination, elevate the soul, thereby imitating the sublime.

Chromatic notes descending, express the pathetic, which is free from any alarm or terror. The performance of these notes should always be with softness, which naturally removes the apprehension of terror. Ascending and descending semitones partake of the nature of the sharp and flat keys; as hath been said concerning the power of musical sounds to touch the passions.

Chromatic notes may be introduced in many places.

If, in a passage, the semitones of the key occur among others, they are to be accounted as chromatic. Therefore
fore flat and sharp keys are equally capable of improvement by them.

Notwithstanding chromatic notes create so much variety and elegance, it must not be underwood that they are to be introduced injudiciously, or without any address; for then they would not only be useless, but injure the musique. Chromatic notes being so affecting and expressive, as we have shewn, their place in vocal musique will easily be determined by the sentiment.

As, on the other hand, to introduce lively or pathetic sounds, where the sense is diffonant from either, is introducing contradiction and confusion.

Neither is it natural in instrumental musique to break in upon a lively strain by slowly-moving chromatic notes. Though at the end of a brisk movement, the transition is good. For music which moves in semitones, though quick notes, must appear slow to the ear, which expects the greater intervals of the diatonic scale, or whole tones.

Yet instrumental musique does properly admit the mixture of chromatic notes, when they are accommodated to the genius of the strain or subject. Neither will it be difficult to judge of this propriety. For musical sounds having a natural tendency to express our ideas, the place of chromatics will readily be found by this mark; it being in the power of the composer to imagine ideas without the help or intervention of words, and so substitute these ideas in the place of words, and make them the subject of his strain. Thus he may fill his mind with the imaginary passion of love, sorrow, anger, detestation, pity, and the like; the expressions of which will be most easily distinguished by musical sounds, and varied as the subject requires. Thus, if two or more of the passages, especially contrary ones, be represented by turns, it will form in the imagination a kind of conversation between persons, which never fails to strike the attention stronger, and make a deep impression on the hearer.

Besides this, the imagination of the composer will be assisted in the invention of variety; and the different passages of the piece will be furnished with notes proper and natural to each; for the same reason that choice and expressive words flow in upon a good writer who is master of his subject. We shall only add, that if sometimes the different passages are allotted to the bass and treble by turns, it will greatly diversify the subject, mark the sentiment stronger, and thereby cause new pleasure. So much for chromatic notes. Notwithstanding, what hath been said in this place doth not respect chromatics only; but in general the whole process of an elaborate piece, in every form and transition of the melody; wherein only there is opportunity for application of what we have here suggested.

The reason why we have given place to chromatics under this second rule of melody, or imitation, we have already assigned; namely, that the use of half-tones is necessary where there is a repetition of a passage in another key. For, whatever proportion of sounds is found in the natural order, the same may be transferred by art, and improved upon every occasion, as thereby imitating nature. And this, by the way, is likewise the reason for the resolution of dissonces by semitones; being taken from the original pattern, or refo-

The second rule of melody is order.

Order in musique is the conducting the melody or air, according to a certain rule, through several intermediate closes, from the beginning to the final close or end of the tune.

A close is the termination of a passage in a concord; which, like a period in senes, is framed with design, and from the preparation from the notes immediately preceding, which are the whole tone above, the half tone below, and the 5th (generally the bass note) is expected by the ear. This is the description of a close, which is ever the final close, especially of quick movements. This preparation is the concord of the 5th to the note on which the close is made; the basses making the great cadence, as we have taught in the rules of composition.

This preparation is in full harmony. But it must be remembered, that there is a preparation also from discord; chiefly the discord of the flat 7th, of which we have said enough in the chapter of discord or figurate defcent. In slow movements there is a preparation to a full close; which shall be described presently.

Every intermediate close has its preparation in imitation of the final close, more or less. For there is no necessity for the parts taking invariably the same member of the chord; so that the treble oft times makes the cadence from the 5th, particularly in quick passages; in which likewise, in the middle of a strain, many imperfect closes may occur, the parts taking the notes indiscriminately as they happen, without any preparation designed. It is enough to mention these.

But in order to conduct the air in each strain, if there be more strains than one, with propriety and method, there must be a close in several places in the harmony of the key. These are called proper closes.

These are also closes made by the introduction of a new semitone, by the addition of a sharp, making the greater 7th not belonging to the harmony of the key. These are rightly called improper closes.

The places and order of both these we shall now assign.

The first proper close falls naturally on the key. This is not meant of the final close; for a close may be made on the key, within a few bars of the beginning; yet this close is seldom made, as not affording variety. Again, the first strain sometimes closes on the key: yet the close of that strain is more properly on the 5th; and the close next after that on the 5th falls naturally on the key.

When a close is made on the 5th, the 4th of the key being removed a semitone higher, becomes the greater 7th by the addition of a sharp. For, in imitation of the final close on the key, there must be a semitone ascending.

Notwithstanding, a close made on the 5th, with a sharp 3d always, from the chord of the 4th in a flat key, without altering the 4th, or bringing in the greater 7th, is accounted an elegance: in which passage the basses take the flat 6th or 3d to the 4th, and thence descends by the semitone into the 5th.

This is never practised but in very slow movements.
Transposition is the removing a tune from one key into another. The use of transposition is to bring a tune within the compass of some instrument, or for the more easy performance on an instrument; some keys being more difficult to perform in than others; especially in wind instruments, as the German flute, &c. For as to instruments that are flopped, as the violin and basset-viol; and instruments with keys, as the organ and harpsichord; all keys are easy to a good performer, who is said to be master of the scale of the instrument.

Secondly, Transposition is absolutely necessary in music for voices and instruments, when it happens that the key in which the music is written is too high or too low for one or more of the voices. In this case, the music must be transposed for the instruments into the key which is nearest to and will best suit the pitch and compass of the voice. For as to the vocal performer, it matters not in what key the music is written for his part, provided he can sing in the close, (or indeed, if he can transpose, as shall be taught in the last chapter, Of singing by note, whether he can sing in the close before him, or not,) if the instrument be accommodated to his voice.

There are two ways of transposing. The first is, when the tune is written in another key, at any distance above or below the original, with the proper flats or sharps prefixed. When this is done, the performance on the instrument is easy; the half-tones of the key, and every other, keeping their due places expressed in the writing. This may be called transposition by writing.

The other method of transposing is by the close; that is to say, when the close is removed, or supposed to be removed, from the place wherein it stands prefixed to the tune.

This removal of the close at once transposes the whole, without alteration of the writing; the use of the close being, as hath been said, to ascertain the names of the notes. We shall shew both these methods of transposition; and first of transposition by writing.
Transposition, in general, is writing or playing a tune in a different key from that wherein it is written, preserving the places of all the semitones.

If the notes in the scale of music expressed no other than whole tones, transposition would be evident to sight. For a series of tones at equal intervals would, when removed to any distance or interval, preserve their places of themselves (to speak), or without the help of art. And the performance of the same on an instrument would be equally easy in all keys; no alteration happening thereby, but changing the names of the notes. And even this would be unnecessary.

The semitones therefore are the causes of any obliquity in the scale of transposition; and therefore the keeping them in their due places is the art we are now speaking of. As it is said in the theory, they are the foundation of writing the same tune in divers keys, which is transposition.

We must have recourse therefore to what hath been said in the theory concerning the essential difference of tune, or the different places of the semitone.

When the first semitone above the key is on the 4th, or 6 semitones to the key; the 3d, which is 5 semitones, is the greater, or sharp 3d; and the tune is from hence said to be in a sharp key.

Again, when the first semitone above the key is on the 3d, or 4 semitones to the key, that being the lesser or flat 3d, the tune is in a flat key. Again, the next semitone in the sharp key is the 8th; and in the flat key on the 6th.

In every sharp key, the semitone must stand in the same places, that is, the 4th and 8th; and in the flat key, in the 3d and 6th.

The name of the sharp key in the scale, whose semitones are in their places without the addition of flat or sharp, is C. Hence C is called the naturally sharp key. Its semitones are F and C.

This is the pattern for transposing in all sharp keys: chiefly by remembering the letters or names of the semitones.

The key in the scale, whose semitones are in their places without the addition of flat or sharp, is A. Hence this is called the naturally flat key. Its semitones are C and F. This is the pattern for transposing in all flat keys; remembering the names of the semitones.

It may be required to transpose from any key with a sharp 3d, into any other of the same; or likewise from any flat key respectively. Notwithstanding, we shall proceed, according to our method, to show what are the keys in the natural succession into which a tune will be transposed, beginning at C the naturally sharp key. As the properties of every key will be discovered by this method; for it will answer every thing that can be required in transposition; and by what a tune may immediately be transposed from any key into any other interval or key that may be required.

For instance, let it be required to transpose from the key of C into that which is next in the natural order of transposition. F is the first semitone in the key of C; which, by the addition of a sharp, becomes F sharp, and consequently the greater 7th to the semitone above it,...
flats, as prefixed in the example, do more methodically follow the removing the greater 7th by a flat.

The demonstration is equally certain and clear in both manners. Let it be remembered, that in transposing, by altering the greater 7th, the key is removed to the 4th above.

Let us proceed to transposition in a flat key; the general rule of which is the same as for the sharp, to remove the semitones, and thereby preserve the proportion of the key.

The different places of the semitone will cause some variation in the effect, or interval of transposition.

Let it be required, according to our method, to transpose out of the open or naturally flat key A, into that which is next by natural succession.

The first semitone in the key of A is the 3d, or C; which, by the addition of a sharp, becomes the greater 7th: wherefore, the new key, or that into which the tune will be transposed, is D. No. 104. For,

Let it be remarked, that the greater 7th which determines the new key in this as well as in the sharp key, is never prefixed to the tune; which to the sharp key always is.

The reason is, that the flat 7th is the property of the flat key. To prefix therefore a sharp to the place of this note on the stave, or beginning of the tune, would be a constant contradiction to all the flat 7ths that may occur throughout the whole air. But the sharp 7th, when brought in at a close, middle or final, or elsewhere where there is no close, is marked particularly as occasion requires.

Another reason for not prefixing a sharp on the stave to the place of the 7th of a flat key is, that, in some keys, the 6th must have its flat set on the stave, or beginning of the writing; a sharp, then, on the place of the 7th would appear a contradiction to sight, and ought therefore to be avoided.

The removal by transposition in the flat key being always to the 4th above, as in the last example, there needs no other example at length of transposition in this key, the same proportion obtaining throughout every key with a flat 3d respectively.

According, then, to this proportion, the next key after D will be G; the 3d of the former, or F natural, becoming F sharp the greater 7th, E flat its 6th.

The next will be C. Its greater 7th is B natural, with the addition of a flat to A its 6th.

The next will be F, with the addition of a flat to D its 6th.

The next would be B flat, with the addition of a flat to G its 6th; never used.

The next would be E flat, with the addition of C flat its 6th, never used.

The next would be A flat, with the addition of a flat to F its 6th, never used.

The next would be D flat, with the addition of two flats to B, never used.

The next would be F sharp, its 6th D, never used. The next is B, its greater 7th A sharp.

The next is E, from whence we ascend by a 4th into the first key A.

I C K.

Hence it is plain there are seven flat keys in use, out of the twelve semitones in the octave. Of which the following are examples, with their proper signs prefixed. No 104.

It may be observed, that by changing the place of the other semitone or 6th, by adding a sharp, the transposition is by two degrees of the former at once; as from A into G, and so on. But this is no more that what hath been done in the second step of this example; yet by putting this sharp to the 6th, it is a short way of transposing into the whole tone below.

It appears from hence, that there are in all sixteen keys in use: a fund for great variety: among which you will observe, that some sharp keys have flats prefixed, and some flat keys have sharps; which cannot by this time appear strange to one who perceives the necessity of preserving the proportion of each, and who must now understand the truth of the 3d axiom of the practice. That no tune composed in a sharp key can be transposed into a flat one, nor a flat one into a sharp; for that would be altering the permanent nature of things.

From comparison of the examples, will be seen what is most worthy of remarking; which is, That whatever sharps or flats belong to any flat key, the same are likewise the property of that sharp key, which is on the same flat key's 3d: for instance, A with a flat 3d, and C with a sharp 3d; so D and F, G and B; and so of all others respectively having the same signs belonging to and prefixed to each.

Hence we collect, that the essential difference of tunes consits in the form, that is, the position of the semitone, and not in the materials of music.

A truth which appeared before in the comparison of discord with harmony; and which will be of great service hereafter, in the art of learning to sing by note.

This inference furnishes us with a proof of the 4th of a flat key, and 6th of a sharp key, having for harmony each his own concord.

A proof which was wanting; as it could not be had from the rules of harmony, neither of these intervals being in the place of a semitone. The general theorem is this: As by axiom 3d the proportion of one single sound is to another according to the natural order of sounds; so the proportion of one chord to another will be according to the natural fucceffion of chords. For a chord is no other than an unity of sounds. But it appears that the fucceffion of chords by transposition in the flat key, is by 4ths, that is, the chord of a note, with a flat 3d; and that of the note's 4th is the same. Now, the harmony of the key or given note is the concord of itself: therefore the harmony of the 4th in a flat key is the concord of itself.

In like manner we demonstrate the harmony of the 6th of a sharp key to be the chord of the same.

And in this the proof lies nearer the truth than in the former case.

For the chord or proportion here is not only the same, but the individual sounds.

For as by comparison, as above, of any flat key with the key of its 3d (which must ever be a sharp key, the flat and sharp 3ds being the compound intervals of the 5th) the
the properties and proportions are not only like, but the same, the difference consisting in the form or place of the semitones; so the chord of one key will be to the chord of the other, not only like, but the same. Now the harmony of every flat key is, by the rule of harmony, the concord of itself: but the concord of the flat key is the relative sharp key's 6th; therefore the harmony or chord of the sharp key's 6th is the concord of itself.

Let us now apply these rules of transposition to the second rule of melody, or perfect imitation, which is the repetition of a passage in notes not belonging to the harmony of the key; by which notes we understand all that have a sharp or flat added, which was not prefixed to the beginning of the same.

The general rule of which is, first name the key in which the passage is written, whether the same be the original key, or that of the tune, or some other; then name the interval of the first note of the passage to the same key.

Whatever interval the imitation begins on, whether a 2d, 3d, 4th, 5th, or any other above or below the passage, it bears the same proportion to the key of the imitation as the first note of the passage to its key. Thus:

- G is to C as A is to D, or
- G : C :: B : E, or again
- D : A :: B : F, or
- D : B :: E : C.

The leading note and key being thus expressed, both of the passage and imitation, shews the proportion of the imitation above or below passage.

If the passage be in a sharp 3d, as the imitation must be so too, the signs, as prefixed to one of the examples of the sharp keys, will be required to be added to the notes of the imitation; and if the passage move with a flat 3d, the examples of the flat key discover the marks wanting in the repetition.

Thus G, the leading note of a passage in C, with a sharp 3d, repeated in the note above; as A and D require two sharps, namely on F and C, the property of D with a sharp 3d.

And the same passage in C with a flat 3d, will in the note above require B marked flat, the property of D with a flat 3d:

And G C sharp 3d, transposed into a 3d, or B E, requires four sharps, on F, C, G, and D, the property of E with a sharp 3d.

The same passage with a flat 3d, or any other passage, will, when transposed into E, require but one sharp on F:

And D B, with a sharp 3d repeated in E C the natural sharp key, require neither sharp nor flat.

But the same, or any other passage with a flat 3d, will, when transposed into C, have three flats on B, E, and A, the property of C with a flat 3d: and if there be no leading note, as it may often happen, nothing more is to be considered than the key.

Thus the use of transposition in perfect imitation is evident.

The second method of transposition is by the cliff.

The use of the cliff is to ascertain the names of the notes. Therefore, the names of the notes will be changed by removal of the cliff.

Now as, in transposing, it is necessary that every interval be preferred, or that the semitones keep their due places; so by altering the name of the first note of the tune, by removing the cliff, all the other notes are altered in proportion.

Thus the removal of the cliff effects at once what was done in the other method by the transposition of every single note of the tune by writing.

This way is easier for the writer, but much more difficult to the performer.

Inasmuch as a confirmed habit in any thing is harder to be changed for a new method, than it is to learn by a certain rule at first.

Therefore the performance in transposing by the cliff can no otherwise be attained, than by constant and repeated practice in all the cliffs, and in all such places as they are used to be set for convenience.

Every one therefore who desires to become a master in performance, after he is well acquainted with the three cliffs in their usual places, ought to accustom himself to perform in every cliff, in whatever place it may be set. This knowledge will not only render the performance convenient to his private amusement, by the variety with which he can furnish himself, by playing the same air in whatever key he pleases; but will also make him an useful member in a concert, by transposing at sight, whenever it may be required to accommodate the instrument to the voice. For let it be understood, that to him who is so well acquainted with the places of the cliffs, as to perform in any of them at sight, nothing more is wanting to his transposing by the cliff at sight than to imagine the cliff is prefixed to such or such a place, and commit to his memory the name of the key in which he is to perform, by transposing according to the removal of the cliff which may be most convenient.

This will fix the places of the semitones, or assign the sharps or flats belonging to the new key, as they are set in the example in the first method of transposing by the writing.

Any of the cliffs may be removed; yet the C cliff or tenor is most commonly in use for this purpose.

The general rule for transposition by the cliff is this.

To transpose into any interval above the key, remove the cliff by the same interval descending. And if the instrument be too high for the voice, to transpose into a lower key, remove the cliff to a convenient interval higher.

For, raising the cliff depresses the notes; and, contrary, setting the cliff lower raises the notes, or transposes them into a higher key, in proportion.

**CHAPTER VI. OF SINGING BY NOTE.**

The art of singing by note is founded on the principles and practice of music. Therefore we have reserved this subject to the last.

To sing by note seems in some respects more difficult to attain than performance on some instruments. In other respects, it is easier and sooner acquired.
The more time is laid out on the practice on some instruments, the more difficult the execution grows, in some cases, that is, according to the construction and compass of the instrument. On the contrary, all the difficulties in learning to sing by note present themselves in the beginning, in appearance greater than they really are; and which a knowledge of the principles of music, and a little of the practice, with a tolerable good ear, will with ease overcome.

Besides, a little time and experience will convince any one of what compasses his voice is, and what degree of performance he is capable of attaining. The principles of singing therefore being well understood, there remains no further difficulty; no one having a right to expect he can execute more than what is within his natural powers.

If this art is not so commonly understood, or the knowledge of it sought, it may be owing to this, that the precepts for learning, or the manner invented, and constantly used, are more perplexed than the subject demands.

How far this may be true, will appear from an observation or two which we shall make on the method now in use.

The art of singing by note rolls on these two principles; the finding the places of the semitones, and tuning them and the whole tones of the octave aright.

The first of these has been delivered in the theory; and also in the practice, under the last article Transposition. The tuning the notes is the subject we are now engaged in.

Let us first examine how far these have been prosecuted in the present method.

The notes of the octave, besides their names in the scale, have been used to be distinguished by these four syllables, Sol, la, mi, fa; accommodated to the purpose of singing by note, in the following order.

Fa, fol, la, mi, fa, fol, la.

Whereof Sol being thrice repeated in the octave, La twice, Fa twice, and Mi once; four syllables express the 8 notes.

The art of tuning by these, or assigning the places of the semitones, is by appointing to Mi the place of the greater 7th; and then Fa immediately following expresses the semitone or key, and the other Fa the 4th. How well forever this may answer the purpose of tuning the half-tones in a sharp key; yet in a flat key, the places of the half-tones being the 3d and 6th, will, according to this order, be expressed by La, the semitone syllable Fa consequently expressing whole tones.

To obviate this difficulty, and reduce things to order, another place of Mi must be assigned, which is the 2d of a flat key: for this Fa will express the semitones on the 3d and 6th.

It is evident then, that before any half-tone or whole-tone can be tuned, the first business must be to find out the place of this mi: now how this can be done by virtue of the sound, or name, or order of these syllables, is not so easy to comprehend.

But admitting the place of mi, or the key, to be known by some previous precept, as indeed ought to be; yet tuning the key as the first semitone in a sharp 3d, and the 3d as the first semitone in a flat key, is beginning at the wrong end in the first case, and thereby not marking the essential difference of tone, which consists in the flat and sharp 3ds, the order of which is disturbed by this variation of the place of mi.

From this want of marking the essential difference in tuning by these syllables, and wherein the beginning and ending is not on the key, some confusion and much trouble and untunableness must arise. And indeed it cannot be imagined, that this or any other essential difference of things can be marked by the same invariable artificial signs, if they be not exactly accommodated to the nature of things. An invention that fails in this, however ingenious it may be in speculation, not being a just representation of nature, doth not merit the name of art.

For instance, if you tune eight notes, whose key hath a sharp 3d beginning on the 5th, your seventh note, which is the 4th of the key, and therefore a whole tone from the succeeding note, will sound like the flat 7th. Again, if you begin to tune on the 2d, your 3d, which is the 4th of the key, is flat; and the found in this succession will appear as if you were tuning in a flat key.

And again, if you tune from the 6th, the deception of a flat 3d is the same as in the last case.

Secondly, if you tune 8 notes whose key hath a flat 3d, and begin on the 7th, your 3d, which is the 2d of the key, is sharp, and your tuning will be as if in a sharp key.

The same deception will appear if you begin to tune on the 3d or 6th.

In a word, whatever other interval you begin on, to tune either with flat or sharp 3d except the key, some semitones will be out of their places: This is rendering what is at first sight attended with some difficulty, more perplexed and obscure.

The ear, the judge of sounds, is deceived, and the judgment misled.

But on the other hand, the ear will naturally and easily distinguish the flat and sharp key, when the key and its 3d are ascertained by beginning and ending on the key.

But otherwise, and where these marks are promiscuously used, the difference of tune, or invariable sign, will appear neither to the ear nor understanding.

We shall end these remarks with one general observation; which is, that by assigning the place of mi to the greater 7th or 2d, in order to find out the key, is resolving one difficulty by a greater, and requiring to do a thing without any means of information offered to compass it.

For as it is true that when the greater 7th or 2d is known, the key is known also, and again, the key being given, you have consequently the 7th or 2d; yet to do either of these, without some intermediate helps, is taking for known the thing fought, which is directly contrary to reason.

Proceed we now to our method of singing by note.

The first principle of singing, is the finding the places of the two semitones in the octave, in any given key.
This hath been pointed out in general, in the theory, where are shown the places of the semitones in the sharp key to be the 4th and 5th, and in the flat key the 3rd and 6th.

But the particular names of the notes, on which the semitones fall in any key whatsoever, and which it is evident must depend on the name of the key, are demonstrated, and examples given, in the practice, under the article of Transposition.

We shall therefore transfer only the examples into this place, in a concise order, which will fully answer our inquiry into the names and places of the semitones.

The nine sharp keys. No. 106.
The seven flat keys. No. 107.

By these examples the particular names of all the semitones are known at sight; as they depend on the name of the key.

Therefore in the example of the sharp keys; the first key being C, the semitones are F and C.
The second G; the semitones C and G.
The third D; the semitones G and D, the 4th and 5th of each respectively.

In the example of the flat keys; the first being A, the semitones are C and F.
The second D; the semitones are F and B flat.
The third G; the semitones B flat and E flat. And so on, the 3d and 6th respectively.

To apply this to the purpose of tuning the notes by the voice: At sight of the sharps or flats prefixed to the tune to be sung, and looking at the key-note, you have of course the places of the semitones, by referring these to the original in the examples set above.

Having thus discovered the difference of tune, you are at the same time determined whether you are to tune the notes of the octave with a flat or sharp 3d.

This tuning of the eight notes, tones and semitones, in their due order, is the first step or principle of tuning all other intervals, or of finging by note.

It will most readily be learned by imitating another voice, or following the notes of an instrument; this is the only safe wherein there is need of any foreign assistance to singing by note.

The instrument we would recommend for this purpose is the organ or harpsichord; as the 4 or 5 semitones, which ascertain the flat or sharp 3d, succeeding each other, being visible on the keys of that instrument in any part, the learner can in this case assist himself, by striking the notes of the octave in either flat or sharp key, on any part of the instrument which will best suit the pitch of his voice, and distinctly repeating them by turns, until his ear is become a perfect judge of the difference of the flat and sharp 3d, as well ascending as descending, and his voice perfect in tuning both.

As musical sounds will be best expressed in tuning by articulate ones; we shall, to answer this convenience, take the four syllables already in use.

As we shall apply them to another purpose than they serve at present; so the order or manner we shall dispose them in, will be altogether different from that.

In tuning, then, the notes of the octave with the instrument, let the syllables be expressed with the notes, in the order of the following examples.

In G sharp. No. 108.

Now, since the flats or sharps adjusting the semitones of any sharp key are exactly the same which belong to the flat key respectively on the 6th, as we have said before in comparing the examples of flat and sharp keys in transposition; therefore the eight notes ascending in a flat key will have the syllables annexed to each, as in the following example on the 6th, without disturbing or departing from the order of the sharp.

In E flat. No. 109.

The semitones and the tones below them being distinguished by the syllables fa and mi, in their respective places in both keys, for descending as well as ascending notes, is the sole use we intend by these syllables; the tuning of the notes, which is to be learned by the instrument, being entirely independent of them.

For tuning the descending notes, then, there need no other examples than the two above written; for reading the same backwards will serve this purpose.

When the ear becomes well acquainted with tuning the notes of the octave by the instrument, it will then be proper to sing the same looking on the notes written on the book; and this should be done in every example of both keys. And let it be remembered, that tuning the notes thus in the natural order, should be to a beginner the prelude to singing any song proposed.

The next step will be, before the learner attempts to sing any part of a song, to tune by the notes the greater intervals, both concord and discord.

The general rule for which is, Tune all the notes of the interval in the natural order, ascending if the interval ascend, and descending if the intervals descend. Then immediately tune both notes of the interval, beginning with the concords.

Thus. No. 110.
Concord in succession.
The concords are. No. 111.
The semitone being the distance between the 3d and 4th, is already known by tuning the notes of this interval.

Note, The name of every greater 7th introduced by a sharp prefixed, is mi.

Next tune the concords of the thirds in succession. In this manner. No. 112.
The 4ths and 5ths being all perfect and like, except one of each, need no repetition.
The 6ths in succession are tuned thus. No. 113.
Lastly, mix the discords and concords as they stand in the natural order; than which nothing will better confirm the just tuning of the intervals, when these rules are to be applied to future practice.

In this manner. No. 114.
This line may be tuned various ways; as, secondly, beginning still on the left hand, tune the 3d and 2d notes, reading backwards; and so on, each two under the flor.

Again, beginning on the right hand, tune the uppermost note and second downwards; then the first and third; and 4 T
so on, still missing one, and omitting constantly the G, or key not below.

And lastly, beginning still on the right hand, tune the second and first, the third and first, the fourth and first, and so on, omitting the G or key note constantly.

The practice of tuning the notes descending of all these examples, is by reading the same backwards.

The tuning the greater intervals in the flat key depending in like manner on tuning the eight notes in succession, according to that series; it is unnecessary to set examples of the same.

The same method of practice equally serving this key, except that the syllables annexed to this key must be repeated, as in the proper example 109.

As in this example of the intervals of the 3d, 6th, and 7th, wherein this key differs from the sharp. No. 115.

The general rule of tuning the intermediate notes of each interval first likewise taking place here.

In order to establish these rules in the memory, and render them of immediate service to the practicioner, especial notice must be taken of the flat and sharp thirds, as also of the flat and sharp sixths, in what places they stand, or how they succeed each other in the order of the key.

The not attending to these differences being the only obstacle that can stand in the way of singing at sight, see them set down at large in the theory, and in the examples of this chapter, No. 112, 113.

When these are well recorded in the memory, together with the sharp 4th or flat 5th, the art of singing by note will not appear so mysterious. This knowledge of the intervals at sight will render the syllables of little or no use, as hath been observed, and especially if words be set to the airs you intend to practice; which we would advise.

When the interval of each note is known at sight by constant practice, and the found of every interval become familiar to the ear, and thereby distinguished immediately upon hearing the name, the learner may make an easy to sing by note some plain song; which is no more than tuning the same intervals, with which he is supposed to be well acquainted in the foregoing lessons.

For as to any other article of knowledge requisite to the performance of the song; as the time of the movement, and lengths of the notes, and the like; if the practicioner hath not been acquainted with them by practice on some instrument beforehand, the principles of them have been delivered in few words in the introduction to this essay.

But besides that this is not the place for speaking of these matters, so neither is there occasion for this knowledge in the very beginning, in strictness of speaking; it being advisable for a beginner to study the tuning the intervals of the song, without respect to any other affection of the sounds; and when he is master of this, to add the practice of the lengths of the notes, as a second consideration.

We shall here set the notes of a plain song, in order to make such application of the rules as may be an introduction towards the further execution of them. No. 116.

First, find out the key, by looking at the last or key note; then see whether it hath a flat or sharp 3d.

The key of this example being G, with one sharp prefixed, is a sharp key; being the second instance in the examples of the nine sharp keys.

Therefore tune the notes of the octave ascending and descending, in a sharp 3d. Immediately after tune the concords in succession. After that, tune the concords of the 3ds, ascending and descending. This will be prelude enough for fixing your attention and ear to the 3ds of the key, and for pitching your voice. Having repeated this two or three times, begin the song in the same pitch or key wherein you sung the prelude. For nothing contributes more to singing in tune, than frequent repetition of notes in one key. Therefore, if your voice be rightly pitched in the prelude, seek not to change it in the song.

The two first notes in the example are Fa, Mi: which interval, it is presumed, you can tune at sight. If otherwise, you must have recourse to the general rule, and tune the intermediate note of that interval ascending, thus, Fa, sol, mi; immediately repeating the interval you want to sound, thus, Fa, Mi.

The next note is the 2d, or Sol, which may be tuned from Mi, the last note, by descending; or from the key, as it hath an equal reference to both. We have laid before you this choice in consideration of your first attempt. But when from experience you are become more perfect in tuning the intervals, the most approved way will be; to make the last note you sung relative to the succeeding one, whose interval you are to tune. Whereby your singing an air will be no other than tuning the intervals as they succeed each other in the movement of the song; which you practiced often before in the natural order, and with which you are supposed to be well acquainted.

The fourth note in the example being Sol, and a 4th to the last note you sung, you will now tune a perfect 4th; not considering this note in relation to the key, to which it is a 5th; but in relation to the last sound note Sol, to which it is a 4th.

This is the method you will pursue in every interval after some improvement gained by practice. Notwithstanding, it will be convenient sometimes to have recourse to the key, by founding it, and taking the interval from the same; whereby you will sing better in tune by keeping to the pitch or key you began in; particularly if the interval from the last note be a great one, or discord, or lie near the key, above or below.

To sum up all; every new note introduced; or not belonging to the harmony of the key, bearing the proportion of some concord or discord, to the preceding note or to the key, will come within the rules laid down, and therefore needs no repetition.

On the principles of the theory and practice of music, we shall now demonstrate the art of transposing with the voice, or singing in any cliff at sight, where with it may happen a person is not acquainted; and this from the knowledge of singing in any other cliff.
Plate CXVIII.

A Semibreve signifies Time is as long as 1, 2, 3, 4, 
or 2 Minums.

4 Crotchets

8 Quavers

16 Semiquavers

2 Demisemiquavers
Plate. CXXV

Andante

\[\text{MUSIC NOTATION}\]
Allegro assai

Plate. CXXXI.
are proportional
MUS

**Theorem.** The intervals of the notes of all sharp keys and flat keys respectively, are proportional. Therefore, the singing at sight in an unknown cliff will be by transposing out of the given cliff, into that you are acquainted with.

This is done by naming the key in the cliff you are to transpose into, and distinguishing whether the song hath a flat or sharp 3d, compared to the examples of the nine sharp and seven flat keys in use, knowing the name of each cliff. Now, the name of the bass cliff is F, of the tenor C, and of the treble G.

Let it be required to sing the notes in the following example in the bass cliff unknown; transposed into the treble with which you are acquainted. No. 117.

The notes in the uppermost line, in the bass cliff, are in C.

In the second line and treble cliff, they are in E.

Demonstration. By the rules of transposition they are the second and fifth instances in the sharp key; then they are proportional; if proportional, the semitones are preferred in their proper places: but keeping or sing the semitones in their places, is tuning the notes of the octave right; therefore this transposition from the bass cliff into the treble is singing by note right.

The same example in the tenor. No. 118.

The notes of the tenor are in F; those of the treble in E. But they are the third and first instances of Sharp keys, therefore proportional; and if proportional, C.

Again, let the treble be the unknown cliff. No. 119.

MUSK, a dry, light, and friable substance, of a dark blackish colour, tinged with purple; it is a kind of perfume of a very strong scent, and only agreeable when in a very small quantity, or moderated by the mixture of some other perfume. It is found in a kind of bag or tumour which grows under the belly of the musk moshiferous. See Moschus.

Musk is brought to us sewed up in a kind of bladders or casks of skin of the bigeef of a pigeon's egg, or larger, each containing from two or three drams to an ounce of musk. These are covered with a brownish hair, and are the real capsules in which the musk is lodged while on the animal. That which is unacclimated appears in mufhes, of loose and friable granules, which are soft to the touch, and easily crumble between the fingers, feeling somewhat smooth and uncruous.

Musk taken inwardly produces ease from pain, quiet sleep, and a copious diaphoresis; hence it has been found of great use in spasmodic disorders, petechial, malignant, putrid fevers, the jail diftemper, hiccoughs, &c. and Dr Wall observes, that it has been found useful in spasmodic disorders, given by way of crifter. The operation of musk in some respects resembles that of opium; but it does not leave behind it any flupor or languidness, which the latter often does. Musk likewise seems likely to answer in those low cafes where sleep is much wanted, and opiates are improper. It is said to be best given in a bolus, in which form those who are moll averfe to perfumes may take it without inconvenience. Fifteen grains or more are now given in a dofe with great success.

MUSKET, a fire-arm born on the shoulder, and used in war. The length of a musket is fixed at three feet eight inches from the muzzle to the pan, and it carries a ball of fourteen to the pound.

MUSKEETOON, a kind of short thick musket, whose bore is the thirty-eighth part of its length; it carries five ounces of iron, or seven and a half of lead, with an equal quantity of powder. This is the shortest fort of blunderbusses.

MUSLIN, a fine fort of cotton cloth, which bears a downy knap on its surface. There are several forts of muslins brought from the East Indies, and more particularly from Bengal; such as dorcas, betelles, muls, tanjeets, &c.

MUSSENDA, in botany, a genus of the pentandria monogyia class. The corolla is funnel-shaped; it has two thickish stigmata; the berry is oblong, and the seeds are disposed into four series. There is but one species, a native of India.

MUSSELBOROUGH, a port-town of Scotland, in the shire of Lothian, six miles east of Edinburgh.

MUSTARD, in botany. See Sinapi.
MUSTELLA, in zoology, a genus of quadrupeds of the order of fere. There are fix erect, sharp, distinct teeth in the upper jaw, and an equal number in the under jaw, but blunter and clover together, and two of them are situated a little farther within the mouth; and the tongue is smooth. There are 11 species, viz. 1. The lutra, with the hind-feet palmated, and the tail about one fourth of the length of the body. It is found in Asia and North America. 2. The lutra, or otter, has palmated feet, and a tail about one half of the length of the body. This animal is exceedingly voracious; but is tender of fish than of flesh. He seldom quits the banks of rivers, and can remain a considerable time below water. The female comes in season in the winter, and brings forth three or four young in March. This animal is found in most countries of Europe and North America. 3. The lutreola has hairy palmated feet, and a white mouth. It is a native of Finland, and feeds upon frogs and fishes. 4. The barbata, is of a reddish colour; and the toes are not connected with a membrane. It is a native of Brazil. 5. The gulo of a dusky red colour, and blackish on the middle of the back. It is found on the woody mountains of Lapland, Russia, and Siberia. The gulo is a very voracious animal, and devours hairs, birds, &c. He has an abominable odor; but his fur is very precious. 6. The martes, or marten, is of a blackish yellow colour; and the toes are not connected. This animal is a native of the southern parts of Europe; it frequents the woods, and feeds upon squirrels, mice, and birds. 7. The putorius, or pole-cat, has unconnected toes, is of a dirty yellow colour, with a white mouth and ears. This animal is very destructive to birds and poultry. He conceals himself during the day; but fleals into barns, dovecotes, hen-houses, &c. in the night, in order to catch his prey. He is a native of most parts of Europe. 8. The furo, or ferret, has red eyes, and unconnected toes. This animal is easily tamed, and frequently employed to hunt rabbits out of their holes. The female is less than the male, and brings forth twice in the year, 5 or 6 at a litter. It is a native of Africa. 9. The zibellina has divided toes; the body is of a dusky yellow colour, with a white forehead, and an ash-coloured throat. It is found in Tartary, and the northern parts of Asia. 10. The reminea has divided toes; and the point of the tail is red. The skin of this animal is a valuable fur, and of a fine white colour. It is a native both of Europe and Asia, and particularly of the northern climates. It feeds upon mice, eggs, &c. and has a very offensive smell. 12. The nivalis has divided toes, and a white body. It is very similar to the ermine, but about one half less in size. It is found in Russia and the northern parts of Europe. See Plate CV. fig. 1, 2, 3, 4.

MUTE, in a general fenfe, signifies a perfon that cannot speak, or has not the ufe of speech.

Mute, in grammar, a letter which yields no sound without the addition of a vowel. The fimple confonants are ordinarily distinguished into mutes and liquids, or semi vowels.

MUTILATION, the retrenching or cutting away any member of the body.

MUTILATION, in Scots law. See Law, Tit. xxxiii.

MUTULE, in architecture, a kind of square modillion set under the corniche of the Doric order.

MUTUM, or Loan, in Scots Law. See Law, Tit. xx. 7.

MUZZLE of a gun or mortar, the extremity at which the powder and ball is put in; and hence, the muzzle ring is the metallic circle, or moulding, that surrounds the mouth of the piece.

MYAGRUM, in botany, a genus of the tetrandria filiculosa class. The pod is terminated with a conical stylus, and generally contains but one seed. There are nine species, only one of which, viz. the fatim, or gold of pleasure, is a native of Britain.

MYCONE, one of the islands of the Archipelago, about twenty-five miles in circumference, Situated in E long. 25° 6', N. lat. 27°.

MYLOGLOSSUM, in anatomy. See Anatomy, p. 304.

MYLOHYOIDÆUS, in anatomy. See Anatomy, p. 304.

MYOLOGY, that part of anatomy which treats of the muscles of the human body. See Anatomy, Part II.

MYOPIA, short-sightedness, a species of vision, wherein objects are seen distinctly only at small distances. See Optics.

MYOSOTIS, in botany, a genus of the pentandria monogynia class. The corolla consists of 5 emarginated segments. There are four species, only one of which, viz. the scorpionides, or mouse-ear scorpion-gras, is a native of Britain.

MYOSURUS, in botany, a genus of the pentandria polygynia class. The calyx consists of 5 leaves connected at the base; it has five fribulated, petal-shaped nectaries; and the seeds are numerous. There is but one species, viz. the minimus, or mouse-tail, a native of Britain.

MYRIAD, a term sometimes used to denote ten thousand.

MYRICA, in botany, a genus of the dicocia tetrandria class. The amentum of the male has alunulated scales; the corolla is wanting both in the male and female; the female has two stili; and the berry contains only one seed. There are five species, none of them natives of Britain.

MYRIAD, a term sometimes used to denote ten thousand.

MYRICA, in botany, a genus of the dicocia tetrandria class. The calyx of both male and female consists of four leaves, and none of them have a corolla: the male has eight lamina, and the female four pellia; and there are four naked seeds. There are two species, both natives of Britain, viz. the ficcatum, or spikewort millfoil; and the verticillatum, or verticillated millfoil.

MYRMECOPHAGA, in zoology, a genus of quadrupeds belonging to the order of bruta; the characters of which are these: There are no teeth in the mouth; the tongue is long and cylindrical; the head terminates in a long snout or muzzle; and the body is covered with
with pretty long hair. There are 4 species, viz. 1. The didaòyla, or white American coati of Seba, has

two toes on the fore-feet and four on the hind feet. This animal is about 7 inches long; the head is two

inches in length; the snout is not fo long as that of the other species; the tail is about an inch longer than

the body, and covered with pretty long hair; the legs are not made for walking, but jumping. He climbs trees,

and hangs on the branches by the extremity of his tail. In this situation he swallows his long tongue in the holes

or fissures of trees, and brings it out covered with ants or other insects. He can live long without nourishment

of any kind, sleeps generally in the day, and searches for food in the night. 2. The tridàyla, tamandua-guaca, or tamanour, has three toes on the fore-feet, and five on the hind-feet, and long hair on the tail.

This animal is about four feet long, and the head and snout about fifteen inches: It is a native of the East

Indies, and feeds upon ants, &c. in the same manner as the didàyla. See Plate CXVI. fig. 4.—3. The ju-

bata, has four toes on the fore-feet and five on the hind ones, and a very hairy tail. This animal resembles the

tridàyla, and is found at the Cape of Good Hope. 4. The tetraòyla, has four toes on the fore feet and five on the hind, with a tail naked at the extremity. It is a native of south America.

MYROBALANS, a kind of medicinal fruit brought from the Indies, of which there are five kinds: 1. The citrine, or Indian myrobalan, of the size of a date, round, of the size of an ordinary prune, less angular, and covered with pretty long hair; the legs are not made for walking, but jumping. He climbs trees, and hangs on the branches by the extremity of his tail. In this situation he swallows his long tongue in the holes or fissures of trees, and brings it out covered with ants or other insects. He can live long without nourishment of any kind, sleeps generally in the day, and searches for food in the night. 2. The tridàyla, tamandua-guaca, or tamanour, has three toes on the fore-feet, and five on the hind-feet, and long hair on the tail. This animal is about four feet long, and the head and snout about fifteen inches: It is a native of the East Indies, and feeds upon ants, &c. in the same manner as the didàyla. See Plate CXVI. fig. 4.—3. The ju-bata, has four toes on the fore-feet and five on the hind ones, and a very hairy tail. This animal resembles the tridàyla, and is found at the Cape of Good Hope. 4. The tetraòyla, has four toes on the fore feet and five on the hind, with a tail naked at the extremity. It is a native of south America.

MYRRH, a vegetable production of the gum or resin kind, issuing by incision, and sometimes spontaneously,

from the trunk and larger branches of a tree growing in Egypt, Arabia, and Abyssinia. The incisions are made twice a-year, and the myrrh oozing out is received on rush-mats dispersed underneath. Myrrh is sent over to us in loose granules of various sizes, from that of a pepper-corn, to the bigness of a walnut. The generality of them, however, are from the size of a pea, to a little more than that of a horse-bean: these are sometimes roundish, but often irregularly long and contorted. The colour of myrrh is a reddish-brown, with more or less of an admixture of yellow, and in the purest pieces it is somewhat transparent. Its taste is bitter and acrid, with a peculiar aromatic flavour, but very nauseous: but its smell, though strong, is not disagreeable. It is to be chosen in clear pieces, light, friable, and of the bitterest taste. Myrrh is of great use in medicine; it powerfully resolves and attenuates thick and viscid blood, and concreted bile, and glutinous humours, and is good in ob-

MYRTUS, the Myrtle, in botany, a genus of the Jaceo-

MYRTIFORM, in anatomy, an appellation given to several parts, from their resembling myrtle berries.

MYRTLE, in botany. See Myrtus.

MYRSINE, in botany, a genus of the pentandria monogynia class. The corolla consists of five segments; and the berry has five cells and five seeds. There is but one species, a native of Ethiopia.

MYRTIFORM, in anatomy, an appellation given to several parts, from their resembling myrtle berries.

MYRTLE, in botany. See Myrtus.

MYRTUS, the Myrtæ, in botany, a genus of the pentandria monogynia class. The calyx consists of five segments, and the corolla of five petals; and the berry contains two or three seeds. There are 13 species, none of them natives of Britain.

MYRIA, the ancient name of a province in Asia, being the north-west part of Nattolia or Asia Minor.

MYTHOLOGY. The word mythology is a Greek compound, that signifies a discourse on fables; and comprehends, in a collective sense, all the fabulous and poetic history of pagan antiquity. It follows therefore, that this science teaches the history of the gods, demi-gods, and fabulous heroes of antiquity; the theology of the pagans, the principles of their religion, their mysteries, metamorphoses, oracles, &c. By this definition, it appears sufficiently what are the objects of which we are to treat in this article.

If we well consider the matter, we shall find, that there were, in pagan antiquity, three different religions. First, That of the philosophers, who treated metaphysically of the nature, the attributes, and of the works of the Supreme Being. They endeavoured to discover the true God, and the manner in which he ought to be worshipped. It is not wonderful, that these men of exalted genius should in some degree ridicule, in their works, the two other positive religions, and those gods on whom they were founded; at the same time that they outwardly professed the established religion, in order to preserve the peace of society, and to avoid the perfections of the legislature, and the insults of the populace. For in fact, was it possible for them to believe the pagan fables? Must they not foresee, that their religion would one day give place to another, while their own works would pass with their names to the latest posterity? And could they suffer the thought, that their reputation would be tarnished in the eyes of that posterity, by having it imagined they believed such idle tales as were broached by the priests of their times? Could Plato, Socrates, Seneca, and Cicero, be unconcerned for their fame among future generations, or hypocritical, as to have entirely concealed their sentiments with regard to these matters?

The second religion was that of paganism, which was the established religion of all the ancient nations except the Jews. This was the doctrine that was taught by the priests, and protected by the sovereigns. Its dogmas were demonstratively false, but not always so absurd as may at first appear, especially if we annex to the divinities, and to the religious ceremonies of the pagans, a feme that is frequently mystic, and always allegoric; if we remember,
that the first heathens deified those great men to whom the rest of mankind were indebted for any signal benefits, as Jupiter, Apollo, Ceres, Bacchus, Hercules, Æsculapius, &c. in order to induce others, as well of the present as future ages, to reverence and to imitate them. Would not an ancient pagan, if he were to return upon the earth, have specious arguments, at least, to support his religion, when he saw weak mortals beautify or canonize, merely by their own authority, other weak mortals (frequently mere pedants,) and place them in heaven, without the permission or approbation of the Supreme Being? Happy is it for mankind, when at different times sagacious pontiffs purge the calendar, and the brains of the people, from a herd of pretended saints, and prevent them, at least after their death, from doing injury to society, by interrupting the industry of the laborious inhabitants with keeping their festivals.

The third religion was idolatry, or the religion of the populace. For the common people, born to be deceived in every thing, confounding in their imaginations the statues of the gods, the idols of their divinities, the emblems of their virtues and of religious worship, with the gods, divinities, virtues and worship themselves, adored these images, and proceeded to extravagancies the most ridiculous, and frequently most criminal, in their ceremonies, feasts, libations, sacrifices, &c. It is to be feared, that, as long as there are upon the earth men of our limited capacities, this triple religion will constantly subvert under different forms; and we are much deceived, if it may not be found under the empire of Christianity itself, notwithstanding the purity of its doctrine. It will be easily conceived, that it is not of the religion of philosophers, nor that of the populace, of which we are to treat in this article of Mythology; but of that which subsisted under the authority of the magistracy and the priesthood, and consequently of paganism in general.

As far as we are able to judge by all the ancient authors we have read, the pagans adored the sovereign Lord of the universe under the name of Fate or Destiny, which we must not confound with Fortune, who was regarded as a subaltern divinity. Jupiter himself, all the gods, every animating being, the heavens, the earth, the whole frame of nature, was subfervient to Destiny, and nothing could reverse its decrees. This divinity was so highly adorable, as to be above all rank; and was regarded as too supreme to be represented under any finer image or statue, or to have any temple erected for its worship. We do not remember to have read, that any sacrifice was ever offered to this Destiny, or that any temple or city was ever dedicated to its name. We are almost inclined to think, that the pagans were fenfible, that the temple and the worship of the God of gods ought to be in the heart of man. Mention is made, indeed, of a temple that was dedicated to the Unknown God, but we are ignorant whether or not Destiny were thereby meant. We must not confound this Destiny, moreover, with the goddesfs of chance, of which there are some antique statues that represent her in a recumbent posture, and playing with little bones; for this was nothing more than an invention of some flautary.

After this general and philosophical idea of the Supreme Being, comes the positive religion of the pagans. This was entirely founded on fable, which took its rise either from ancient traditions, or historical events, altered or augmented by the imaginations of the poets, by superstitition, or by the credulity of the people; or else it consisted of allegoric or moral fictions. A crowd of writers, among the rest N. de Comte, Natalis Comes,) the abbots Binner and Pluche, &c. have made many researches into the origin of fable: and they think they have discovered its source, 1. in the vanity of mankind; 2. in the want of letters and characters; 3. in the delusive eloquence of orators; 4. in the relations of travellers; 5. in the fiction of poets, painters, flautaries, and dramatic writers; 6. in the diversity and uniformity of names; 7. in the ignorance of true philosophy; 8. in the foundation of colonies, and the invention of arts; 9. in the desire of having gods for our ancestors; 10. in the imperfect or false interpretation of the holy scriptures; 11. in the ignorance of ancient history; 12. in a like ignorance of chronology; 13. in that of foreign languages; 14. in the translation of the religion of the Egyptians and Phœnicians into Greece; 15. in the ignorance of geography; and, 16. in the belief that the first people had of the intercourse of gods with men. It is certain, that all these matters taken together are sufficient to produce many thousands of fables; are more than sufficient to enable us to deceive ourselves and others, and to give rise to infinite reveries. But we should take care how we draw from these sources demonstrations that might be used, by infidels, as arguments to overthrow the history of the Jews; a people the most stupid, most credulous, and oftentimes of all others. In the mean time, the pagan philosophers themselves asserted, that it was a god who invented the fable: so much they were convinced of its ingenuity, and of its strong tendency to instruct mankind in their duty.

Mythology therefore, when properly treated, begins with making learned researches into the real origin of fable, of paganism, and of that idolatry which was its consequence. It recurs for this purpose even to the beginning of the world; and after finding that Laban, the father-in-law of the patriarch Jacob, was a maker of idols; and that he had his little images, or household-gods, which he formed of baked earth, and which shews that idolatry existed in the greatest antiquity; it then explains cosmogony, and theogony, or the belief that the first inhabitants of the earth entertained of the creation of the universe, and what the pagan theology taught of the genealogy of their false gods. It begins with the tradition of the Chaldeans, a people so ancient, that Nimrod was their first king; but at the same time so credulous and superflitious, that we may regard them as the authors of all those fables, and the propagators of all those visions, that have since blinded human reason. According to this tradition, a monster named Ænemos, or Oer, half fish and half man, sprang from the sea, before the chaos was completely dispersed, and gave laws to the Chaldeans. A woman called Omorka, reigned over all the earth. Bel custer in two, and made of one moiety the heavens, and of the other the earth. They likewise invented the two primitive beings, of which the good one, who was named Ærmasdes, had the direction.
tion of heaven; and the other, called Ariminus, that of hell.

The science of mythology then teaches the theology of the Phenicians; concerning whom it draws great lights from Sanchoniathon, a priest of Beryt, who lived before the Trojan wars, more than four hundred years before Hefiod and Homer, and of whom Eusebius has preserved considerable fragments. From thence it passes to the theology of the Egyptians; of whom Thot or Thaut, the founder of that nation, was likewise, they say, their first historian; that Sanchoniathon even copied from him; and of whom we find many relations in the Greek historians, especially in Herodotus, Diodorus Siculus, and in Eusebius of Caesarea. It then examines the theology of the Atlanteens, who dwelt on the western part of Africa, and of whom Diodorus alone has preserved any account. From thence it proceeds to the theology of the Greeks, which is far better known to us, as we find accounts of it, more or less particular, in numberless Greek and Latin writers. This theology had the same foundation as that of the Romans; the latter having only extended it, by adding to the Greek divinities certain gods or demi-gods, formed of their heroes, and certain symbolic and allegorical divinities, which mythology explains at the same time: and it is on this occasion that it enters into a particular explication of the cosmogony and theology of Ovid; whose book of metamorphoses contains as copious descriptions as we could desire of the fables of the ancients: what was their belief concerning the habitations of the blessed after their death, or of the Elysian fields; as well as of their hell or tartarus; of the dog Cerberus; of the ferryman Charon; of the furies; of the four rivers, Cocytus, Lethe, Phlegethon, and Styx, which water the tartarian regions, &c. The learned have likewise made many inquiries, and many ingenious discoveries, concerning the theology of the ancient Germans, Celts, the Scythian and Hyperborean nation. In the latter place, this science furnishes great lights on the theology of the Brahmins, the Troglovides, the Indians, the Chinese, and even the Americans; all which it concludes with a regular and minute examination of the pagan theology, and particularly that of the poets.

All these matters being well digested in the minds of those who would make a regular study of pagan theology, they continue their researches into the time, the epoch and place of the real origin of paganism and idolatry; and they prove that the pagans began by adoring the heavenly bodies, the stars and planets. They next examine into the progress of idolatry: what were the temples of the pagans, their altars, their inclosures, their sacred groves, their asylums, the idols and statues of their deities; in what manner they were represented; what were their sacrifice, the victims that were offered; what were the sacred vessels, the censers and other instruments that were used in the sacrifices, libations, and other religious ceremonies: concerning the priests, priestesses, and other attendants on the service of each divinity: what were the festivals that were celebrated among the Greeks and Romans, as well as among the orientals; what the days of penitence and supplication, the feasts or the gods of lec- tillery, their invocations or incantations, and exorcisms, the religious ceremonies observed at laying the foundations of cities, &c.

Divination, or the prediction of future events, a weakness that has at all times possessed the human mind, forms also an important article of pagan theology. It is therefore in this place, that mythology considers the nature of Oracles; and in particular, 1. The oracle of Delphi, the most ancient of Greece; 2. That of Jupiter, Hammon or Ammon, in Libya; 3. That of Jupiter Philus; 4. That of Apollo, both of Heliopolis; 5. That of Apollo of Delphi; 6. That of Trophonius in Boeotia; 7. That of Venus of Aphaca, a country between Byblos and Heliopolis, situated on a small lake; and a great number of other oracles of less note, dispersed over Greece and other countries. It also examines in what manner these oracles gave their answers, the ceremonies that were observed in consulting them, the frantic emotions of the priestess Pythia on her tripod; and those of other priests. It then endeavours to determine, if there ever were in fact any Sibyls, which, whatever has been said, is still very doubtful: it draws, however, from all the sources of antiquity, a kind of history of these Sibyls, and of their prophecies. It next passes to the examination of the nature of auguries, auspices, haruspices, prefages, prodigies, and phenomena, of expiations and abolutions, of the magic and astrology of the ancients, &c. Whoever has thoroughly studied all these objects, is fully provided with the preliminary knowledge that is necessary to enable him to proceed steadily and securely through the darkness of ancient mythology, and he may thereby advance more confidently to the examination of the nature of the pagan divinities themselves.

The celebrated treatise of Cicero De natura Deorum will here furnish great lights: but modern authors who have treated on these matters, have not been contented with this alone: they have, to our eye, extracted the essence of all antiquity, of which they have formed systems; but unskilfully scarce ever agree with each other. As philosophers, it is of very little importance for us to know what was the nature of these gods, seeing we know that they were merely fabulous: but as historians and antiquaries, it concerns us to know what was the nature that was attributed to them in general; and, in particular, what were the origin, genealogy, rank, functions, authority, and operations, that were attributed to each divinity; and it is on these matters that we have still some remarks to make.

The gods of the ancient Greeks and Romans were all either Dii majorum gentium, or Dii minorum gentium; that is, of the first or second order. The former were all called consentes, magni consiltores, &c. According to Ennius they were twelve in number, and are included in these verses:

Juno, Vesta, Minerva, Ceres, Diana, Venus, Mars, Mercurius, Jovis, Neptunus, Vulcanus, Apollo.

To these were added eight others under the title of dei latiri, which were Sol, Luna, Tellus, Genius, Janus, Saturnus, Liber, and Pluto. The second order, or minorum gentium, were called Adepti, Memoximi, Minufeciarii, Putatitii, Indigetes, Semones, &c. the principal of which were Aëliculapius, Bacchus, Calfor, Fauna, Hercules.
According to the second division, all their deities were classified into:

1. Celestial gods.
2. Terrestrial gods.
3. Sea gods.
4. The Infernal deities, or inferi.
5. The Pales, Pan, Pomona, Priapus, the Satyrs, Silenus, Silenus, the god Terminus, Vesta or Rhea, Bercynthia, Vulcan, Harpocrates, &c.
6. The sea-gods were Neptune, Amphitrite, Thetis, Canopus, Gaucus, Ino, the Nereids, Nereus, Oceanus, Paolon, Triton, &c.
7. The inferior gods were Pluto, Proserpine, Charon, Minos, Aeacus, Rhadamantus, the Furies, Death, Night, the Fates, Plutus, &c.
8. The third division ranged the deities according as they presided over:
   a. Over the pregnancy of women (Pregnantia).
   b. At parturitions (Parturienti).
   c. At births (Nascientium).
   d. At adulteries.
   e. At marriages.
   f. To which they added, Dii morales, or moral gods.
   g. Funeral gods.
   h. The gods of parturition, Juno, Lucina, Diana, Egerio, Profa, Poltvera, Menagenata, Latona, the gods that were called Nixi, or of labour, &c.
9. The gods of birth were Janus, Opis, Nacion, Cunia, Carmenta, Vagina, Ruma, Rumia, Potina, Educa, Ollago, Carnea, Nundina, Statilinus, Fabulius, Paventia, &c.
10. The gods of adultery were Juvenus, Agenoria, Streuna, Stimula, Horta, Quius, Murcia, Adeona, Aboena, Volupra, Orbena, Pellonia, Numeria, Camocna, Sentia, Angerca, Heres, Martea, Laverna, the god Averruncus, Confus, Catus, Volumnus and Volumna, Honorius, Aius Locuti, &c.
11. The nuptial gods were Diana, Domiduca, Domitius, Hymenzeus or Hymen, Jugatimis, Jupiter perfectus, Juno perfecta, Juno cynthia, Juna unxia, Lucina, Mantutia, Muinitus, Dea Mater prima, Suada, Thalaffis, Venus, &c.
12. The moral gods were called Virtus, Honus, Fides, Spec, Justitia, Pietas, Misericordia, Clementia, Publicitia, Veritas, Mens, Concordia, Pax, Salus, Felicitas, Libertas, Pecunia, Ritus, Invidia, Contumelia, Impudentia, Calumnia, Frans, Difcordia, Furor, Fama, Fortuna, with all their epithets good or bad, Febulis, Pavor and Palor, Pauperitas, Nesperitas, Tempelitas, Silentium, &c.
13. The funeral gods were Pluto, Libitina, Nenia, Death, the Fates, &c.

Hermod indeed pretends that all these gods derived their origin from chaos; but we have already pointed out more just sources. It is almost incredible to what a prodigious number the superflitious and weakens of the Greeks and Romans multiplied these deities; there have been thirty thousand of them enumerated. It will not be expected that we should here attempt to describe them, nor will it be remarkable if we have forgotten to mention even some of the first rank: Although, vail as this company of gods is, mythology does not omit to trace the history of the greatest part of them, as is taught by paganism; and they who are defirous of particular information in these matters may consult with advantage the theogony of Hesiod, the catalogue of Apollodorus, the metamorphoses of Ovid, the fables of Hyginus, Lylif Gregorii Gyraldi Synthagma de Dios Gentilium, the mythology of Natalis Comes, the books of Gerard Volius de Idolatria Gentilium, Johannes Boccattii Genealogia Deorum, the Pantheon of Pomey, the history of heaven by Abbe Pluche, the historic explanation of fables by Abbe Bannier, and numberless other works of the same kind in all languages.

There were still many other divisions, of which the pagans made use to mark the rank, the functions and nature of their several deities. For example, the gods called Vealta, or the mother of all the gods, was adored by all people in general. Mars, Bellona, Victoria, Fortunata, &c., assisted all parties. The topical gods, on the contrary, were adored in particular countries only; as Astarte in Syria, Derceto and Semiramis among the Assyrians, Isis and Osiris by the Egyptians, Quirinus at Rome, &c.

The title Semones, which was given to a certain class of deities, was doubtless derived from the Homunculi, that is, demi-men; and signified the same as semi-di or demi-gods. These were monarchs and illustrious heroes, or those great men who were the founders of cities and nations, that were deified by way of apotheosis. Pythagoras had taught the Chaldeans the doctrine of transmigration; and that, after their death, those who were virtuous would be elevated to the rank of deities. This doctrine was adopted by all the pagan world. The apotheosis, after they had erected temples and altars to the new gods, was celebrated with much solemnity. In the last ceremony, an eagle was fixed on the catafalque, or funeral pile, on which was placed the image of the hero; and when the pile began to burn, the eagle was let loose, who, mounting into the air with the flames, seemed to carry the soul of the departed hero up to heaven.

Mythology informs us also, who those persons were that antiquity regarded as the children of the gods, such as Thefeus, Hippolytus, Paris, &c.; what the pagans believed with regard to the nature of their Genii and Demons, of their Dryades, Hamadryades, Nymphs, Tritons, Sirens, Fauns, Sylvans, Centaurs, and other subaltern deities; and in this manner it explains all the systems of the positive religion of the Greeks and Romans. They who are desirous of extending their knowledge of paganism still further, of knowing the dogmas of each particular people, what were their gods, and the various manners in which they were worshipped, such as Apis, Isis, Osiris, &c., the adoration of crocodiles and onions, &c., among the Egyptians, must study the different theogonies of these people; and notwithstanding all the informations which ancient and modern authors afford, this study is yet bountiful, and attended with many difficulties and uncertainties. Though it appears demonstrative, that the origin of paganism, and of idolatry in general, was derived from the Chaldeans, from whom the Egyptians drew that doctrine which they after transmitted to all other nations; and consequently that the primordial divinities were the same, under different denominations, among all the Idolatrous nations of the earth.

The nature of this work will not permit us to descend to further particulars. But to give our readers an idea...
of the manner in which mythology treats its subjects, and of the method that should be observed in studying fable, or the history of the gods of antiquity, which we shall here give, by way of example, a carftory description of Parnassus and its inhabitants.

Parnassus was a mountain of Phoebis, that had two summits, one of which was called Tithorea, and the other Hyampeus. Others say, that one of these hills was named Helicon, and the other Cytheron; and that it is an error to imagine, that Helicon was a mountain of Boreas. However be that, this double hill was consecrated to Apollo and the Muses, who there held their usual residence. According to fable, there had been a remarkable combat on this hill, between Helicon and Cytheron. Whoever slept on Parnassus, when he waked, became a poet. Apollo had there a temple. There also was the fountain Caflalia, into which Apollo had metamorphosed a nymph that he loved, and had given to its waters the power of making all who drank of them poets. At the foot of Parnassus flowed the river Hippocrene, that had the fame virtue; and the source of which was opened by a stroke of the foot of the horse Pegafus. This river nourished a great number of swans, that were regarded as sacred. Pegasus was a winged horse, that belonged to Apollo, and grazed on the summits of Parnassus. He sprang from the blood of Medufa, when Perseus cut off her head, which was placed among the stars. Such was the delicious abode of Apollo, the fon of Jupiter and Latona, who was born, with his twin sister Diana, in the island Delos. He killed the Cyclopes, who forged the thunderbolts which Jupiter had overthrown his son, Eclathapius; but for that presumption, he was forced to leave heaven, and become an inhabitant of the earth. He guarded the oxen of Admetus; he aided Neptune to build the walls of Troy, and Alcmeius in forming the labyrinth. He killed the dragon or serpent Python. He invented music and physic; and was honoured as the god of poets and physicians. He was represented as a young man without a beard, his head surrounded with rays, and bearing in his hand a bow, or a lyre. As the ancients denoted the sun by the name of Apollo, they sometimes represented him also as seated in a chariot, drawn by two white horses, preceded by Aurora and the star Venus: Phaeton his son, being desirous of conducing these horses, was thrown into the sea. Apollo was also called Phæbus, Titan, and Sol. He is known to have had amours with Ares, Cybele, Μελενη, Μυλνεα, Μανθο, Μινος, Κυλλοπε, and others; by whom he had Delphæ, Naxæ, Miletus, Arcæ, Garamas, Sirus, Linus, Orpheus, and other children. He had peculiar honours paid him in the Pythian games at Delphos, and in the secular games at Rome.

The Muses were the companions of Apollo in his rural abode. They were likewise called the learned sibyls; as also the Cinaeis, Heliocinon, Parnassian, Aonian, Pierian, Pegasean, Aganippian, Theopian, Libethrian, and Caflalian sibyls. They were the daughters of Jupiter and Mnemosyne, and were regarded as the goddesses of sciences and arts in general. There were nine of these Muses; to whom they attributed, 1. to Clio, history, 2. to Melpomene, tragedy, 3. to Thalia, comedy, 4. to Euterpe, flutes and other pneumatic instruments of music, 5. to Terpsichore, the harp and the dance, 6. to Erato, the lyre and the lute, 7. to Calliope, heroic verse, 8. to Urania, astronomy, and 9. to Polyhymnia, rhetoric and eloquence. The Graces also sometimes quitted Venus to pay their court to Apollo.

Such was the idea they entertained of Parnassus and its inhabitants. There is no doubt but that, under these fabulous representations, these sensible images, were concealed allegoric and moral meanings; nor can it be denied but that their method of cultivating the arts and sciences, by this manner of expressing their ideas, was as ingenious and pleasing as it is possible to imagine. Every other subject that paganism embraced, it treated with the same genius, and in a manner equally pleasing; and though that religion was altogether fallacious, yet we must allow that it was extremely well calculated to promote the polite arts, by those refined, noble, graceful, brilliant images, by those charming subjects, which it constantly prefented, and which it still offers to the poet, painter, sculptor, and every other artificer.

But this was not a power sufficiently strong to secure paganism against that villifick, that decline and dissolation, which finally attends all the productions of this world. This religion, which had subfitted for near five thousand years, and almost from the origin of the human race, gradually declined in proportion as the lights of Christianity and philosophy illuminated the minds of mankind. For though the pagan religion, and the fables on which it was founded, were pleasing and favourable to the polite arts, they were not however calculated to satisfy the minds of philosophers, nor to promote the real good of mankind, by securing their temporal and eternal happiness. It is even surprising that so great a genius as the emperor Julian should attempt to revive the embers of paganism, which infenibly declin'd, and had received a mortal blow at the beginning of the fourth century by the emperor Constantin the great. Julian employed all the resources of his imagination, of his eloquence, of his power, and even of his own fatal example, to revive it; but in vain. The fatal period of paganism was arrived, and nothing could save it from destruction. The furious Theodosius, to whom bigotted priests and historians have alligned the name of Great, totally overthrew it toward the clofe of the fame century, destroyed those temples and altars which yet subfitted, dispersed its colleges, and exterminated its priests. From that dire epoch, nothing of paganism has remained, except some ruins dispersed in the remote parts of the earth, and among people wretched and almost unknown; where this religion, once so flourishing and universal, is now degenerated into grofs and dignitifal idolatry.

MYURUS, in medicine, an epithet for a sort of sinking pulle, when the second stroke is less than the first, the third than the second, and so on.
NABOB, a viceroy or governor of one of the provinces of the Mogul's empire, in India.

NABONASSAR, or Eul. of Nabonassar. See Astronomy, p. 473.

NADIR, in astronomy, that point of the heavens which is diametrically opposite to the zenith, or point directly over our heads. See Astronomy, p. 435.

NÆVI, in surgery, marks or excrescences made on the skin of an infant before its birth, vulgarly supposed to be occasioned by the imagination of the mother.

NAHUM, or the prophecy of Nahum, a canonical book of the Old Testament.

Nahum, the seventh of the twelve lesser prophets, was a native of Elkoshai, a little village of Galilee. The subject of his prophecy is the destruction of Nineveh, which he describes in the most lively and pathetic manner; his style is bold and figurative, and cannot be exceeded by the most perfect masters of oratory. This prophecy was verified at the siege of that city by Allyagos, in the year of the world 3373, 622 years before Christ.

NAIADS, in mythology, the nymphs of the fountains. See Mythology.

NAIANT, in heraldry, a term used in blazoning fishes, when borne in an horizontal posture, as if swimming.

NAJAS, in botany, a genus of the monoeica monandria class. The calyx of the male is cylindrical and bicolored; the corolla consists of four segments; and there are no filaments. The female has neither calix nor corolla, but one pistil and an ovated capsule. There is only one species, viz. the marina, found in the European seas.

NAI, angulus, in anatomy. See Anatomy, p. 266.

NALEs, in building, &c. small spikes of iron, brass, &c. which being drove into wood, serve to bind several pieces together, or to hold something upon them.

NAIL, also a measure of length, containing the sixteenth part of a yard.

NAIRN, a borough and port town of Scotland, eighteen miles east of the town of Inverness.

NAISSANT, in heraldry, is applied to any animal issuing out of the midst of some ordinary, and shewing only his head, shoulders, forefeet and legs, with the tip of his tail; the rest of his body being hid in the shield, or some charge upon it; in which it differs from insinuant, which denotes a living creature arizing out of the bottom of any ordinary or charge.

NAKED SEEDS, in botany, are those that are not enclosed in any pod or cafe.

NAMA, in botany, a genus of the pentandria digynia class. The calyx consists of five leaves, and the corol-
NARWAL, in ichthyology, *Monodon*.

NARDUS, in botany, a genus of the triandria monogynia class. It has no calix, and the corolla consists of six leaves, and the nectarium of one entire funnel-shaped leaf; and the stamina are situated within the nectarium. There are 13 species, only two of which are natives of Britain, viz. the poeticus, common pale daffodil, or primrose peerless; and the pseudo-narcissus or wild English daffodil.

NARCISSUS, the daffodil, in botany, a genus of the triandria monogynia class. The corolla consists of six leaves, and the nectarium of one entire funnel-shaped leaf; and the stamina are situated within the nectarium. There are 13 species, only two of which are natives of Britain, viz. the poeticus, common pale daffodil, or primrose peerless; and the pseudo-narcissus or wild English daffodil.

NARCISSUS, in botany, a genus of the triandria monogynia class. It has no calix, and the corolla consists of two valves. There are five species, only one of which, *Ch. filicae*, or malt-grass, is a native of Britain.

NARRATION, in oratory and history, a recital or rehearseful of a fact as it happened, or when it is supposed to have happened. See Description.

NARWAL, in ichthyology. See Monodon.
it up from the surface of the ground, and call it soap-
earth. The earliest account we have of it is in the
Scriptures, where we find that the salt called nitre in
three times would ferment with vinegar, and had an
alterative quality, so that it was used in baths and in
washing things. Solomon compares the singing of

N A T U R A L  H I S T O R Y.

Natural History, is that science which not only
gives complete descriptions of natural productions
in general, but also teaches the method of arranging them
into Classes, Orders, Genera, and Species. This defi-

The First Class, MAMMALIA, is subdivided into 7
Orders; the characters of which are taken from the
number, structure, and situation of the Teeth.

Order I. The Primates, have 4 incisors, or
fore-teeth, in each jaw, and one dog-tooth. N. B.
By one dog-tooth, Linnæus means one on each
side of the fore-teeth in both jaws.—This order
includes 4 genera, viz. Homo, Simia, Lemur,
Vespertilio. See these articles.

Order II. The Bruta, have no fore teeth in ei-
ther jaw.—This order includes 6 genera, viz.
Elephas, Trichechus, Bradypus, Myrmecophaga,
Manis, Dasylys. See these articles.

Order III. The Feræ, have, for the most part,
6 conical fore-teeth in each jaw.—This order in-
cludes 10 genera, viz. Phoca, Canis, Felis, Vi-
verra, Mustela, Ursus, Didelphis, Talpa, Sorex,
Erinaceus. See these articles.

Order IV. The Glires, have 2 fore-teeth in
each jaw, and no dog-teeth.—This order in-
cludes 6 genera, viz. Hystric, Lepus, Caflor, Mus,
Sciurus, Nodilia. See these articles.

Order V. The Pecora, have no fore teeth in
the upper jaw, but 6 or 8 in the under-jaw.—
This order includes 6 genera, viz. Camelus,
Mufchus, Cervus, Capra, Ovis, Bos. See these
articles.

Order VI. The Bellüe, have 6 teeth in each jaw.—
This order includes 4 genera, viz. Equus, Hippopotamus, Sus, Rhinoceros. See
these articles.

Order VII. The Cats, or wh;le kind, have no
uniform character in their teeth, being very dif-

tant from one another; but are sufficiently
resembled by the other orders of Mammals,
like those of the orders, almost entirely taken from the Teeth,
The Second Clasp, AVES, is subdivided into six Orders, the characters of which are taken chiefly from the structure of the Bill.

Order I. The Accipitres, have a hooked bill, the superior mandible, near the base, being extended on each side beyond the inferior; and in some, the superior mandible is armed with teeth. This order includes 4 species, viz. Vultur, Falco, Strix, Lanius. See these articles.

Order II. The Picæ, have a convex, compressed bill, resembling a knife. This order contains 22 genera, viz. Buphaga, Certhia, Corvus, Culcua, &c. See these articles.

Order III. The Anseres, have an obtuse bill, gibbous at the base, broadest at the point, covered with a smooth skin, and furnished with teeth: The tongue is fleshy; and the toes are palmarated, or webbed. This order includes 12 genera, viz. Anca, Anas, Columbus, Diomedia, &c. See these articles.

Order IV. The Grallæ, have a long, obtuse, and somewhat cylindrical bill: The tongue is undivided, and fleshy; and the thighs are naked. This order contains 18 genera, viz. Ardea, Fulica, Tringa, Charadrius, &c. See these articles.

Order V. The Gallinæ, have a convex bill; the superior mandible is vaulted over the inferior, and the margin of the superior mandible folds over the inferior one: The nostrils are half covered with a convex cartilaginous membrane: The restractes, or principal quill-feathers of the tail, are always more than twelve in number; and the feet are divided, but connected at the innermost joint. This order contains 7 genera, viz. Didus, Phasianus, Meleagris, Pavo, &c. See these articles.

Order VI. The Passeres, have a conical sharp-pointed bill; and the nostrils are oval, wide, and naked. This order contains 15 genera, viz. Caprimulgus, Alauda, Columba, &c. See these articles.

The generic characters of this class are taken from peculiarities in the bill, the nostrils, the tongue, the feet, the feathers, the face, the figure of the body, &c. The characters which serve to distinguish the species are very various: For example, the colour of particular feathers or parts of feathers; crests of feathers on the head, disposed in different manners; the colour of the cere or wax; the colour of the feet; the shape and length of the tail; the number, situation, &c. of the toes; the colour and figure of the bill; &c.

The Third Clasp, AMPHIBIA, is divided into four Orders.

Order I. The Reptiles, have legs, and breathe by the mouth. This order contains 4 genera, viz. Testudo, Draco, Lacerta, Rana. See these articles.

Order II. The Serpentes, have no legs, and breathe by the mouth. This order contains 6 genera, viz. Crotalus, Boa, Coluber, Anguis, Anymphia, Cecilia. See these articles.

Order III. The Nantes, are furnished with lungs, and at the same time breathe by lateral gills, and the rays of their fins are cartilaginous. This order contains 14 genera, viz. Accipenfer, Balistes, &c. See these articles.

Order IV. The Meantes, have both lungs and gills; and the feet are furnished with toes and claws. This order contains but one genus, viz. the Siren. See Siren.

The generic characters of this class are taken from the general figure of the body; from their having tails or no tails; being covered with a bill; having teeth or no teeth in the mouth; being furnished with wings; having covered or naked bodies; from the number, situation, and figure of the futa and scales; from the number and situation of the spiracula; from the situation of the mouth, &c.

The specific characters are so various, that it would be superfluous to enumerate them.

The Fourth Clasp, PISCES, is subdivided into four Orders, the characters of which are taken from the situation of the belly-fins.

Order I. The Apodes, have no belly-fins. This order contains 8 genera, viz. Ammodytes, Anarrhicas, Muræna, &c. See these articles.

Order II. The Jugulares, have the belly-fins placed before the pectoral fins. This order includes 5 genera, viz. Callionymus, Blennius, Gadus, &c. See these articles.

Order III. The Thoracici, have the belly-fins placed under the pectoral fins. This order comprehends 15 genera, viz. Gabius, Labrus, Sardus, &c. See these articles.

Order IV. The Abdominales, have the belly-fins placed behind the pectoral fins. This order contains 17 genera, viz. Fistularia, Efox, Clupea, Cyprinus, &c. See these articles.

The generic characters of this class are taken from peculiarities in the head, the mouth, the teeth, the nostrils, the rays in the membrane of the gills, the eyes, the general figure of the body, the figure of the tail, the situation of the spiracula, &c.

The specific characters are taken from peculiarities in all the parts above enumerated, and many others.
The Fifth Class, INSECTA, is subdivided into 7 Orders. the characters of which are taken from the wings.

Order I. The Coleoptera, have four wings, the two superior ones being semicrustaceous, and furnished with a straight future.—This order comprehends 40 genera, viz. Attelabus, Scorabaeus, Cocinella, Melo, &c. See these articles.

Order II. The Hemiptera, have four wings, the two superior ones being semicrustaceous, and incumbent, i.e., the inner edges lie above one another.—This order includes 12 genera, viz. Blatta, Gryllus, Cicada, &c. See these articles.

Order III. The Lepidoptera, have four wings, all of them imbricated with scales.—This order contains 3 genera, viz. Papilio, Sphinx, Phalæna. See these articles.

Order IV. The Neuroptera, have four wings interwoven with veins, like a piece of network, and no sting in the anus.—This order includes 7 genera, viz. Libella, Ephemera, Hesperobus, &c. See these articles.

Order V. The Hymenoptera, have the same characters with the former, only the anus is armed with a sting. But this mark is peculiar to the females and neuters; for the males have no sting.—This order comprehends 10 genera, viz. Apis, Formica, Vespa, &c. See these articles.

Order VI. The Diptera have two wings, and two ciliated halteres or balances behind each wing.—This order contains 10 genera, viz. Combilus, Asilus, Tipula, &c. See these articles.

Order VII. The Apteræ, have no wings. This order contains 14 species, viz. Acarus, Araneæ, Pediculus, &c. See these articles.

The Sixth Class, VERMES, is divided into five Orders.

Order I. The Intestina, are the most simple animals, being perfectly naked, and without limbs of any kind.—This order contains 7 genera, viz. Lumbicus, Spiniæcus, Palsioa, Gordius, Acanth, Hirudo, Mycine. See these articles.

Order II. The Mollusca, are likewise simple naked animals, without any shell; but they are brachiated, or furnished with a kind of limb.—This order comprehends 18 genera, viz. Alcida, Limaré, Doris, Tethys, Aphrodita, Sepia, &c. See these articles.

Order III. The Testacea, have the same characters with those of Order II, but are covered with a shell.—This order includes 39 genera, viz. Anomia, Cardium, Argonauta, Bulla, Buccinum, &c.

Order IV. The Lithophyta, are compound animals, fixed upon a calcareous base constructed by the creatures themselves.—This order includes the corals, of which there are 4 genera, viz. Tubipora, Madrepora, &c. See these articles.

Order V. The Zoophyta, are compound animals, furnished with a kind of flowers, and having a vegetating root and stem.—This order contains 3 genera, viz. Spongæa, Gorgonæa, Tubularia, Hydra, &c. See these articles.

This short explanation will enable any person who understands the Latin language to peruse the Systema Naturæ of Linnaeus without the assistance of a master; which was the principal object of this article.

NATURAL PHILOSOPHY, that which considers the powers and properties of natural bodies, and their mutual actions on one another. See MECHANICS, OPTICS, ASTRONOMY, HYDROSTATICS, PNEUMATICS.

NATURALIZATION, See LAW, Tit. x. 6.

NATURALS, among physicians, whatever naturally belongs to an animal, in opposition to non-naturals. See NON-NATURALS.

NATURE, according to Mr. Boyle, has eight different significations; it being used, 1. For the Author of nature, whom the schoolmen call Natura Naturans, being the same with God. 2. By the nature of a thing, we sometimes mean its essence; that is, the attributes which make it what it is, whether the thing be corporeal or not; as when we attempt to define the nature of a fluid, of a triangle, &c. 3. Sometimes we confound that which a man has by nature, with what accrues to him by birth; as when we say, that such a man is noble by nature. 4. Sometimes we take nature for an internal principle of motion; as when we say, that a stone by nature falls to the earth. 5. Sometimes we understand, by nature, the established course of things. 6. Sometimes we take nature for an aggregate of pow-

powers belonging to a body, especially a living one; in which sense physicians say, that nature is strong, weak, or spent; or that, in such or such diseases, nature left to herself will perform the cure. 7. Sometimes we use the term nature for the universe, or whole system of the corporeal works of God; as when it is said of a phoenix, or chimera, that there is no such thing in nature. 8. Sometimes too, and that most commonly, we express by the word nature a kind of semi-deity, or other strange kind of being.

If, says the same philosopher, I were to propose a notion of nature, less ambiguous than those already mentioned, and with regard to which many axioms relating to that word may be conveniently understood, I should first distinguish between the universal and the particular nature of things. Universal nature I would define to be the aggregate of the bodies that make up the world, in its present state, considered as a principle; by virtue whereof they act and suffer, according to the laws of motion prescribed by the Author of all things. And this makes way for the other subordinate notion; since the particular nature of an individual consists in the general nature applied to a distinct portion of the universal...
NAVARRE, a province of Spain, bounded by French
province of Navarre on the north-east, by Arragon on the south-
east, by Old Castile on the south-west, and by Guip-
coa on the west; it is a mountainous country.
French Navarre, separated from Spanish Navarre
on the south-west by the Pyrenees; it is only thirty
miles long, and fifteen broad; being one of the most
barren provinces in France.
NAVE, in architecture, the body of a church where the
people are disposed, reaching from the ballater, or
rail of the choir, to the chrefh door.
NAVEL, in anatomy, the centre of the lower part of
the abdomen; being that part where the umbilical ve-
fels paffed out of the fetus to the placenta of the mo-
th. See Midwifery.
NAVEL-WORT, in botany. See Cotyledon.
NAVEREINI, a town of Gascony, in France, sixteen
miles south-east of Bayonne.
NAVEW, in botany. See Brassica, of which it is a
species.
NAVICULARE OS, in anatomy. See Anat. p. 186.
NAVIDAD, a port-town of Mexico, in the province of
Mecheconian: W. long. 110°, and N. lat. 19°.

NAVIGATION.

NAVI G ATI ON, is the art of conducing or carrying a
ship from one port to another. In order to un-
derstand this science, particularly the theoretical parts of it, it
is necessary that the student be acquainted with the general
principles of Geometry, Astronomy, and Trigono-
metry. See these articles.

Sect. I. Of the Log-line and Compass.
1. The method commonly made use of for measuring
a ship's way at sea, or how far the runs in a given space
of time, is by the log-line, and half-minute glafs.
2. The log is a flat piece of wood, in shape like a foun-
der, having a piece of lead faftened to its bottom, which
makes it fland or swim upright in the water: to this log
is tied or faftened a long line, which is called the log-line;
and this is commonly divided into certain spaces, each of
which is, or ought to be, a proportional part of a
nautical mile (60 of which make a degree of a great circle
on the earth) as half a minute (the time allowed for the
experiment) is of an hour.
3. These spaces are called knots, because at the end of
each of them there is a piece of twine with knots in it,
inreved between the strands of the line, which fhews how
many of these spaces or knots are run out during the
half minute. They commonly begin to be counted at the
distance of about 10 fathom or 60 feet from the log; that
fi the log, when it is hove over board, may be out of the
edge of the ship's wake before they begin to count; and
for the more ready discovery of this point of commence-
ment, there is commonly flaffened at it a piece of red rag.
4. The log being thus prepared, and hove over board
from the poop, and the line veered out (by the help of a
reel, that turns easily, and about which it is wound) as
faft as the log will carry it away, or rather as the ship fails
from it, will fhew, according to the time of veering, how
far the ship has run in a given time, and consequently her
rate of failing.
5. A degree of a meridian, according to the exacft
measures, contains about 69.545 English miles; and each
mile by the statute being 5280 feet, therefore a degree
of a meridian will be about 367200 feet; whence the $\frac{2}{6}$
of that, viz. a minute, or nautical mile, muft contain
6120 standard feet; consequently, since $\frac{1}{4}$ minute is the
$\frac{1}{7}$ part of an hour, and each knot being the fame part
of a nautical mile, it follows, that each knot will contain
the $\frac{1}{7}$ of 6120 feet, viz. 51 feet.
6. Hence it is evident, that whatever number of knots
the ship runs in half a minute, the fame number of miles
the will run in one hour, fuppofing her to run with the
fame degree of velocity during that time; and therefore
it is the general way to heave the log every hour to know
her rate of failing: but if the foce or direction of the
wind vary, and not continue the fame during the whole
hour; or if there has been more fail fet, or any fail handed,
that fo the ship has run swifter or slower in any part of
the hour than she did at the time of heaving the log;
then there muft be an allowance made accordingly for it,
and this muft be according to the differece of the artift.
7. Sometimes when the ship is before the wind, and
there is a great sea fettin after her, it will bring home
the log, and consequently the ship will fail fatter than is
given by the log. In this cafe it is ufual, if there be a very
great sea, to allow one mile in ten, and lefs in proportion,
if the fea be not fo great. But for the generality, the
ship's way is really greater than that given by the log;
and therefore, in order to have the reckoning rather before
than behind the ship, (which is the fame way,) it will be
proper to make the space on the log-line between knot
and knot to confilt of 50 feet instead of 51.
8. If the space between knot and knot on the log-line
should happen to be too great in proportion to the half-
minute glafs, viz. greater than 50 feet, then the distance
given by the log will be too short; and if that space be
too small, then the distance run (given by the log) will be
too great; therefore to find the true distance run in ei-
ther cafe, having measured the distance between knot and
knot, we have the following proportion, viz.
As the true distance, 50 feet, is to the measured distance;
fo are the miles of distance given by the log, to the true
distance in miles that the ship has run.

Example
EXAMPLE I. Suppose a ship runs at the rate of 65 knots in half a minute; but measuring the space between knot and knot, I find it to be 56 feet: Required the true distance in miles.

Making it, As 50 feet is to 56 feet, so is 6.25 knots to 7 knots; I find that the true rate of failing is 5.72 miles in the hour.

EXAMPLE II. Suppose a ship runs at the rate of 64 knots in half a minute; but measuring the space between knot and knot, I find it to be only 44 feet: Required the true rate of failing.

Making it, As 50 feet is to 44 feet, so is 6.5 knots to 5.72 knots; I find that the true rate or failing is 5.72 miles in the hour.

As the number of seconds the glafs runs, is to half a minute, or 30 seconds; so is the distance given by the log, to the true distance.

EXAMPLE I. Suppose a ship runs at the rate of 74 knots in the time the glafs runs; but measuring the glafs, I find it runs 34 seconds: Required the true rate of failing.

Making it, As 34 seconds is to 30 seconds, so is 7.5 to 6.6; I find that the ship fails at the rate of 6.6 miles an hour.

EXAMPLE II. Suppose a ship runs at the rate of 64 knots; but measuring the glafs, I find it runs only 25 seconds: Required the true rate of failing.

Making it, As 25 seconds is to 30 seconds, so is 6.5 knots to 7.8 knots; I find that the true rate of failing is 7.8 miles an hour.

In order to know how many seconds the glafs runs, you may try it by a watch or clock, that vibrates seconds; but if neither of these be at hand, then take a line, and to the end fastening a plummet, hang the other upon a nail or peg, so as the distance from the peg to the centre of the plummet be 395 inches: Then this put into motion will vibrate seconds; i.e. every time it passes the perpendicular, you are to count one second; consequently, by observing the number of vibrations that it makes during the time the glafs is running, we know how many seconds the glafs runs.

If there be an error both in the log line and half-minute glafs, viz. if the difference between knot and knot and the log-line be either greater or less than 50 feet, and the glafs runs either more or less than 30 seconds; then the finding out the ship's true distance will be somewhat more complicate, and admit of three cases, viz.

CASE I. If the glafs runs more than 30 seconds, and the distance between knot and knot be less than 50 feet, then the distance given by the log-line, viz. by allowing 1 mile for each knot the ship fails while the glafs is running, will always be greater than the true distance, since either of these errors give the distance too great. Consequently, to find the true rate of failing in this case, we must first find (by Art. 8.) the distance, on the supposition that the log-line is only wrong, and then with this (by Art. 9.) we shall find the true distance.

EXAMPLE. Suppose a ship is found to run at the rate of 6 knots; but examining the glafs, I find it runs 35 seconds; and measuring the log-line, I find the distance between knot and knot to be but 46 feet: Required the true distance run.

First, (by Art. 8.) We have the following proportion, viz. As 50 feet : 46 feet :: 6 knots : 5.52 knots. Then (by Art. 9.) As 35 seconds : 30 seconds :: 5.52 knots : 4.73 knots. Consequently the true rate of failing is 4.73 miles an hour.

CASE II. If the glafs be less than 30 seconds, and the distance between knot and knot be more than 50 feet; then the distance given by the log will always be less than the true distance, since either of these errors lessen the true distance.

EXAMPLE. Suppose a ship is found to run at the rate of 7 knots; but examining the glafs, I find it runs only 25 seconds; and measuring the space between knot an knot on the log line, I find it is 54 feet: Required the true rate of failing.

First, (by Art. 9.) As 25 seconds : 30 seconds :: 7 knots : 8.4 knots. Then (by Art. 8.) As 50 feet : 54 feet :: 8.4 knots : 9.072 knots. Consequently the true rate of failing is 9.072 miles an hour.

CASE III. If the glafs runs more than 30 seconds, and the space between knot and knot be greater than 50 feet; or if the glafs runs less than 30 seconds, and the space between knot and knot be less than 50 feet: then, since in either of these two cases the effects of the errors are contrary, it is plain the distance will sometimes be too great, and sometimes too little, according as the greater quantity of the error lies; as will be evident from the following examples.

EXAMPLE I. Suppose a ship is found to run at the rate of 64 knots per glafs; but examining the glafs, it is found to run 36 seconds; and by measuring the space between knot and knot, it is found to be 58 feet: Required the true rate of failing.

First, (by Art. 8.) As 50 feet : 58 feet :: 9.5 knots : 11.02 knots. Then (by Art. 9.) As 36 seconds : 30 seconds :: 9.072 knots : 8.7 knots. Consequently the ship's true rate of failing is 8.7 miles an hour.

EXAMPLE II. Suppose a ship runs at the rate of 6 knots per glafs; but examining the glafs, it is found to run only 20 seconds; and by measuring the log-line, the distance between knot and knot is found to be but 36 feet: Required the true rate of failing.

First, (by Art. 8.) As 50 feet : 38 feet :: 6 knots : 4.56 knots. Then (by Art. 9.) As 20 seconds : 30 seconds :: 4.56 knots : 6.84 knots. Consequently the true rate of failing is 6.83 miles an hour.

But if in this case it happen, that the time the glafs takes to run be to the distance between knot and knot, as 30, the seconds in half a minute, is to 50, the true distance
distance between knot and knot; then it is plain, that
whatever number of seconds the glass consists of, and
whatever number of feet is contained between knot and
knot; yet the distance given by the log line, will be the
ture distance in miles.

12. Though the method of measuring the ship's way
by the log-line, described in the foregoing articles, be
that which is now commonly made use of; yet it is sub
ject to several errors, and these very considerable. For
first, the half-minute or quarter-minute glasses (by which,
and the log, the ship's way is determined) are seldom or
never true, because dry and wet weather have a great
influence on them; so that at one time they may run
more, and at another time fewer than 30 seconds, and
it is evident that a small error in the glass will cause a
sensible one in the ship's way. Again, the chief property
of the log is to have it swim upright, or perpendicular to
the horizon; but this is too often wanting in logs, because
few mariners examine whether it is so or not; and generally
take it upon trust, being satisfied if it weigh a little
more at the stern than the head: and from this there
flows an error in the reckoning; for if the log does not
swim upright, it will not hold water, nor remain steady
in the place where it is heaved, since the least check in
the hand in veering the line will make it come up fe-
veral feet: this repeated will make the errors become
fathom's, and perhaps knots, which, how insensible fo-
ever they appear, are miles and parts of miles, and amount
to a good deal in a long voyage. Another inconvenience
attending the log-line is its stretching and shrinking; for
when a new line is first used, let it be ever so well ftreteh-
ed upon the deck, and measured as true as possible, yet
after wetting it shrinks considerably; and consequently to
be the better assured of the ship's way by the log-line, we
ought to measure and alter the knots on it every time be-
fore we use it; but this is seldom done often than once
a week, and sometimes not above once or twice in a
whole voyage; also when the line is measured to its
greatest degree of shrinking, it is generally left there;
and when, by much use, it comes to stretch again, it is
f seldom or never mended, though it will stretch beyond
what it first shrunk. These, and many other errors,
too well known, attending that method of measuring the
ship's way by the log-line, plainly answers for a great
many errors committted in reckonings. So it is to be
wished, that either this method were improved or amend
ed, or that some other method left subject to error were
found out.

13. The meridian and prime vertical of any place cuts
the horizon in 4 points, at 90 degrees distance from one
another, viz. North, South, East, and West; that part
of the meridian which extends itself from the place to
the north point of the horizon is called the north line;
that which tends to the south point of the horizon, is
called the south line; and that part of the prime vertical
which extends towards the right hand of the observer,
when his face is turned to the north, is called the eafi
line; and lastly, that part of the prime vertical which
tends towards the left hand, is called the west line; the
four points in which these lines meet the horizon, are
called the cardinal points.
there form certain angles with one another; and since, if we move never so little towards the east or west, from one place to another, we thereby change our meridian, in every place the east and west line being perpendicular to the meridian; it follows, that the east and west line in the first place will not coincide with the east and west line in the second, but be inclined to it at a certain angle: and consequently all the other rhomb lines at each place will be inclined to each other, they always forming the same angles with the meridian. Hence it follows, that all rhombs, except the four cardinals, must be curves or helicoidal lines, always tending towards the pole, and approaching it by infinite gyrations or turnings, but never falling into it. Thus let $P$ (No. 2.) be the pole, $EQ$ an arch of the equator, $PE$, $PA$, &c. meridians, and $EFGHKL$ any rhomb: then because the angles $PEF$, $PFG$, &c. are by the nature of the rhomb line equal, it is evident that it will form a curve line on the surface of the globe, always approaching the pole $P$, but never falling into it; for if it were possible for it to fall into the pole, then it would follow, that the same line could cut an infinite number of other lines at equal angles, in the same point; which is absurd.

19. Because there are $32$ rhumbs (or points in the compass) equally distant from one another, therefore the angle contained between any two of them adjacent will be $11^\circ 15'$, viz. $\frac{1}{12}$ part of $360^\circ$; and so the angle contained between the meridian and the $NNE$, will be $22^\circ 30'$, and between the meridian and the $W$ will be $22^\circ 30'$; and so of the rest, as in the following table.

A Table of the Angles which every $\frac{1}{2}$ Point of the Compass makes with the Meridian.

<table>
<thead>
<tr>
<th>North Points</th>
<th>South Points</th>
<th>East Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>NNE ESE ENE</td>
<td>SSE NE SE E</td>
<td>ENE ESE E</td>
</tr>
<tr>
<td>40 36</td>
<td>41 30</td>
<td>45 00</td>
</tr>
<tr>
<td>40 36</td>
<td>41 30</td>
<td>45 00</td>
</tr>
<tr>
<td>40 36</td>
<td>41 30</td>
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<tr>
<td>40 36</td>
<td>41 30</td>
<td>45 00</td>
</tr>
<tr>
<td>40 36</td>
<td>41 30</td>
<td>45 00</td>
</tr>
</tbody>
</table>

Sect. 2. Of Plain Sailing.

1. This method of failing supposes the earth to be a plane, and the meridians parallel to one another; and likewise the parallels of latitude at equal distance from one another, as they really are upon the globe. Though this method be in itself evidently false; yet in a short run, and especially near the equator, an account of the ship's way may be kept by it tolerably well.

2. The angle formed by the meridian and rhumb that a ship fails upon, is called the ship's course. Thus if a ship fails on the NNE rhomb, then her course will be $22^\circ 30'$, and so of others.

3. The distance between two places lying on the same parallel counted in miles of the equator, or the distance of one place from the meridian of another counted above on the parallel passing over that place, is called meridional distance; which, in plain failing, goes under the name of departure.

4. Let $A$ (No. 3.) denote a certain point on the earth's surface, $AC$ its meridian, and $AD$ the parallel of latitude passing through it; and suppose a ship to fail from $A$ on the NNE rhomb till she arrive at $B$; and through $B$ draw the meridian $BD$, (which, according to the principles of plain failing, must be parallel to $CA$) and the parallel of latitude $BC$; then the length of $AB$, viz. how far the ship has failed upon the NNE rhomb, is called her distance; $AC$ or $BD$ will be her difference of latitude, or nothing; $CB$ will be her departure, or easting; and the angle $CAB$ will be the course. Hence it is plain, that the distance failed will always be greater than either the difference of latitude or departure; if being the hypotenuse of a right-angled triangle, whereof the other two are the legs; except the ship fails either on a meridian, or a parallel of latitude; for if the ship fails on a meridian, then it is plain, that her distance will be just equal to her difference of latitude, and she will have no departure; but if she fail on a parallel, then her distance will be the same with her departure, and she will have no difference of latitude. It is evident also from the figure, that if the course be less than $4$ points, or $45$ degrees, its complement, viz. the other oblique angle, will be greater.
greater than 45 degrees, and so the difference of latitude will be greater than the departure; but if the course be greater than 4 points, then the difference of latitude will be less than the departure; and lastly, if the course be just 4 points, the difference of latitude will be equal to the departure.

5. Since the distance, difference of latitude, and departure, form a right-angled triangle, in which the oblique angle opposite to the departure is the course, and the other its complement; therefore, having any two of these given, we can (by plain trigonometry) find the rest; and hence arise the cases of plain-sailing, which are as follow.

CASE I. Course and distance given, to find difference of latitude and departure.

Example. Suppose a ship fails from the latitude of 30° 25' north, NNE, 32 miles, (No. 4.) Required the difference of latitude and departure, and the latitude come to. Then (by right angle trigonometry,) we have the following analogy, for finding the departure and sum of the distance AC, viz.

As radius — — — — 10.00000

To the distance AC — 32 — — — 1.50515

So is the side of the course A 22° 30' — — — 9.58284

to the departure BC — — — 12.25 — 1.08799

So the ship has made 12.25 miles of departure easterly, or has got so far to the eastward of her meridian. Then, for the difference of latitude or northing the ship has made, we have (by rectangular trigonometry) the following analogy, viz.

As radius — — — — 10.00000

To the distance AC — 32 — — — 1.50515

So is the side of the course A 22° 30' — — — 9.58284

To the difference of lat. AB 29.57 — 1.47077

So the ship has northing 1.47077

And since her former latitude was north, and her difference of latitude northerly; therefore, To the latitude failed from — — — 30°, 25' N

Add the difference of latitude — — — — 0°, 29.57

And the sum is the latitude come to 30°, 54.57 N

By this case are calculated the tables of difference of latitude, and departure, to every degree, point, and quarter-point of the compasses.

CASE II. Course and difference of latitude given, to find distance and departure.

Example. Suppose a ship, in the latitude of 45° 25' north, NNE, 32 miles, (No. 4.) Required the course and departure. Hence arise the cases of plain-sailing, which are as follow. And (by rectangular trigonometry) we have the following analogy, for finding the departure BD, viz.

As radius — — — — 10.00000

To the difference of latitude AB 90 — 1.95424

So the ship has got 73.84 miles to the eastward of her former meridian.

Again, for the distance AD, we have (by rectangular trigonometry) the following proportion, viz.

As radius — — — — 10.00000

To the distance AD — — — — 116.4 2.00600

So is the side of the course F 56° 50' — 9.91985

And the remainder — — — — 0°, 40'

equal to 70 miles, is the difference of latitude.

By rectangular trigonometry we have the following proportion for finding the angle of the course F, viz.

As the distance failed DF 126 — 2.10037

is to radius — — — — 10.00000

so is the diff. of latitude FD 70 — 1.84510

And since her former latitude was north, and her difference of latitude northerly; therefore, From the latitude failed from — — — 56° 50'

Subtract the observed latitude — — — 55° 10'

and the remainder — — — — 0°, 40'

equal to 70 miles, is the difference of latitude.

By rectangular trigonometry we have the following proportion for finding the angle of the course F, viz.

As the distance failed DF 126 — 2.10037

is to radius — — — — 10.00000

So is the side of the course F 56° 50' — 9.91985

And the remainder — — — — 0°, 40'

equal to 70 miles, is the difference of latitude.

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is to radius — — — — 10.00000

So is the side of the course F 56° 50' — 9.91985

And the remainder — — — — 0°, 40'

equal to 70 miles, is the difference of latitude.
to the tangent of course G — 29°, 19' — 9.74928
which, because the ship is failing between southeasterly and easterly, will be south 29° 19' east, or SSE 1/2 east nearly.

Then for the distance, we shall have (by rectangular trigonometry) the following analogy, viz.

As radius — — — — — 10.00000
is to the diff. of latitude GK — 114 — 2.05690
so is the secant of the course — 29°, 19' — 10.0592

to the distance GL — — — 130.8 — 2.11642

consequently the ship has failed on a SSE 1/2 east course 130.8 miles.

Case V. Distance and departure given, to find course and difference of latitude.

Example. Suppose a ship at sea fails from the latitude of 34° 24' north, between north and west 124 miles, and is found to have made of setting 86 miles. Required the course steered, and the difference of latitude or northings made good.

In this case (by rectangular trigonometry) we have the following proportion for finding the course ADB, (No. 8.) viz.

As the distance AD — 124 — 2.09342
is to radius — — — — — 10.00000
so is the departure AB — 86 — 1.93450

to the fine of the course D — 43°, 54' — 9.84108
so the ship's course is north 33° 54' west, or NW 1/2 west nearly.

Then for the difference of latitude, we have (by rectangular trigonometry) the following analogy, viz.

As radius — — — — — 10.00000
is to the diff. of latitude BD — 89.35 — 1.95108
so is the secant of the course 43°, 54' — 9.85766

to the distance AD — 124 — 2.09342

which is equal to 1 degree and 29 minutes nearly. Hence, to find the latitude the ship is in, since both latitudes are north, and the ship failing from the equator; therefore,

To the distance failed from — — — — 124 — 2.09342
add the difference of latitude — — — — — 1°, 29'

the sum is — — — — — 35°, 53'

the latitude the ship is in is north.

Case VI. Course and departure given, to find distance and difference of latitude.

Example. Suppose a ship at sea, in the latitude of 43° 40' north, who's departure from the ship is 54 miles. Required the distance and difference of latitude made good on that course.

In this case, by Rectangular Trigonometry, and by Case 2. we have the following proportion for finding the distance, (No. 9.) viz.

As the fine of the course G — 33°, 45' — 9.74474
is to the departure HM — 96 — 1.98227
so is radius — — — — — 10.00000

to the distance GM — 172.8 — 2.22375

Then, for the difference of latitude, we have (by rectangular trigonometry) the following analogy, viz.

As the tangent of course G — 33°, 45' — 9.82489
is to the departure HM — 96 — 1.98227
so is radius — — — — — 10.00000

to the difference of latitude GH — 143.7 — 2.15738

equal to 2°, 24' nearly. Consequently, since the latitude the ship failed from was south, and the failing still towards the south,

To the latitude failed from — — — — — 24°, 30'
add the difference of latitude — — — — — 2°, 24'

and the sum is — — — — — 26°, 54'
is the latitude she is come to south.

6. When a ship steers several courses in 24 hours, then the reducing all these into one, and thereby finding the course and distance made good upon the whole, is commonly called the resolving of a traverse.

7. At sea they commonly begin each day's reckoning from the noon of that day, and from that time they let down all the different courses and distances steamed by the ship till noon next day upon the log-board; then from these several courses and distances had from the compass and log-line, they compute the difference of latitude and departure for each course (by Case 1. of Plain Sailing); and these, together with the courses and distances, are let down in a table called the traverse table; which consists of five columns: in the first of which are placed the courses and distances; in the two next the differences of latitude belonging to these courses, according as they are north or south; and in the two last are placed the courses belonging to these courses, according as they are east or west. Then they sum up all the northings, and all the southings; and taking the difference of these, they know the difference of latitude made good by the ship in the last 24 hours, which will be north or south, according as the sum of the northings or southings is greatest: The same way, by taking the sum of all the eastings, and likewise of all the westings, and substracting the lesser of these from the greater, the difference will be the departure made good by the ship last 24 hours, which will be east or west according as the sum of the eastings is greater or less than the sum of the westings; and from the difference of latitude and distance made good by the ship last 24 hours, found as above, they find the true course and distance made good upon the whole (by Case 4. of Plain Sailing), as also the course and distance to the intended port.

Example. Suppose a ship at sea, in the latitude of 48° 24' north at noon any day, is bound to a port in the latitude of 43° 40' north, whose departure from the ship is 144 miles east; consequently the direct course and distance of the ship is SSE 1/2 east 315 miles; but by reason of the shifting of the winds she is obliged to steer the following courses till noon next day, viz. SE 36 miles, SSE 64 miles, NNE 48 miles, SSW 1/2 west 54 miles, and SEAS 1/2 east 74 miles. Required the course and distance made good the last 24 hours, and the bearing and distance of the ship from the intended port.

The solution of this traverse depends entirely on the 1st and 4th cases of Plain Sailing; and first we must (by Case 1.) find the difference of latitude and departure for each course. Thus,

1 Course SEAS distance 36 miles.

For departure.

As radius — — — — — 10.00000
is to the distance — — — — — 56 — 1.74819

10
### NAVIGATION

**The Traverse Table.**

<table>
<thead>
<tr>
<th>Course</th>
<th>Distance</th>
<th>Diff. of Lat.</th>
<th>Departure</th>
</tr>
</thead>
<tbody>
<tr>
<td>S E S</td>
<td>56</td>
<td>46.57</td>
<td>31.11</td>
</tr>
<tr>
<td>S S E</td>
<td>64</td>
<td>55.67</td>
<td>46.57</td>
</tr>
<tr>
<td>N W W</td>
<td>48</td>
<td>26.67</td>
<td>39.91</td>
</tr>
<tr>
<td>S W W</td>
<td>54</td>
<td>31.11</td>
<td>15.67</td>
</tr>
<tr>
<td>S E S</td>
<td>44</td>
<td>57.21</td>
<td>46.94</td>
</tr>
</tbody>
</table>

**Diff. of Lat.** 187.91 46.97 **Pep.** 24 hours; consequently, to find the true course and distance made good by the ship in that time, it will be, (by Case 4 of Plain Sailing.)

As the difference of latitude — 187.91 2.27393

is to radius — — 10.00000

so is the departure — 46.97 1.67182
to the tangent of the course 14°, 03' 9.39789

which is S E 1/2 east nearly. Then for the distance, it will be,

As radius — — 10.00000

is to the difference of latitude 187.91 2.27393

so is the secant of the course 14°, 03' 10.00450
to the tangent of the course 14°, 03' 9.39789

there remains — — 45°, 16' N
take the latitude the ship is bound for lies in the latitude of 43° 40' north, and consequently south of the ship; therefore,

From the latitude the ship is in — — 45°, 16' N
take the latitude the ship is bound for — — 43°, 40' N

and there remains — — 1°, 36' or 96 miles, the difference of latitude or southing the ship has to make. Again, the whole easting the ship had to make being 144 miles, and the having already made 46.97 or 47 miles of easting; therefore the departure or easting the ship has to make will be 97 miles; consequently, to find the direct course and distance between the ship and the intended port, it will be (by Case 4 of Plain Sailing)

As the difference of latitude — 96° 1.68227

is to radius — — 10.00000

so is the departure — 97° 1.98677
to the tangent of the course 45°, 19' 10.00450

And

As radius — — 10.00000

is to the difference of latitude 96° 1.68227

so is the secant of the course 45°, 19' 10.15293
to the difference — — 136.5 2.13620

whence the true bearing and distance of the intended port is SE, 136.5 miles.
**NAVIGATION.**

**SECTION 3. OF PARALLEL SAILING.**

1. Since the parallels of latitude do always decrease the nearer they approach the pole, it is plain a degree on any of them must be less than a degree upon the equator. Now in order to know the length of a degree on any of them, let PB (No. 10.) represent half the earth's axis, PA a quadrant of a meridian, and consequently A a point on the equator, C a point on the meridian, and CD a perpendicular from that point upon the axis, which plainly will be the sine of CP the distance of that point from the pole, or the co-sine of CA its distance from the equator; and CD will be to AB, as the sine of CP, or co-sine of CA, is to the radius. Again, if the quadrant PAB is turned round upon the axis PB, it is plain the point A will describe the circumference of the equator whose radius is AB, and any other point C upon the meridian will describe the circumference of a parallel whose radius is CD.

**Cor. I.** Hence (because the circumference of circles are as their radii) it follows, that the circumference of any parallel is to the circumference of the equator, as the co-sine of its latitude is to radius.

**Cor. II.** And since the wholes are as their similar parts, it will be, As the length of a degree on any parallel is to the length of a degree upon the equator, so is the co-sine of the latitude of that parallel to radius.

**Cor. III.** Hence, as radius is to the co-sine of any latitude, so are the minutes of difference of longitude between two meridians, or their distance in miles upon the equator, to the distance of these two meridians on the parallel in miles.

**Cor. IV.** And as the co-sine of any parallel is to radius, so is the length of any arch on that parallel (intercepted between two meridians in miles) to the length of a similar arch upon the equator, or minutes of difference of longitude.

**Cor. V.** Also, as the co-sine of any one parallel is to the co-sine of any other parallel, so is the length of any arch on the first, in miles, to the length of the same arch on the other in miles.

2. From what has been said, arises the solution of the several cases of parallel sailing, which are as follow.

**Case I.** Given the difference of longitude between two places; both lying on the same parallel; to find the distance between those places.

**Example I.** Suppose a ship in the latitude of $54^\circ 20'$ north, fails directly west on that parallel till she has suffered her longitude $12^\circ 45'$; required the distance sailed on that parallel.

The difference of longitude reduced into minutes, or nautical miles, is $765'$, which is the distance between the meridian she sailed from, and the meridian come to upon the equator; then to find the distance between these meridians on the parallel of $54^\circ 20'$, or the distance sailed, it will be, by Cor. 3. of the last article,

As radius — — — — 10,00000

is to the co-sine of the lat. — $54^\circ 20'$ — 9,76572
so are the minutes of diff. long. — 765 — 2.88306
to the distance on the parallel — 446.1 — 2.64938

**Example II.** A degree on the equator being 60 minutes or nautical miles; required the length of a degree on the parallel of $51^\circ 32'$.

By Cor. 3. of the last article, it will be

As radius — — — — 10,00000

is to the co-sine of the latitude $51^\circ 32'$ — 9,79393
so are the minutes in 1 degree on the equa. $60 1.77815$
to — — — — 27.32 1.57198
the miles answering to a degree on the parallel of $51^\circ 32'$.

By this problem the following table is constructed, shewing the geographic miles answering to a degree on any parallel of latitude; in which you may observe, that the columns marked at the top with D.L. contain the degrees of latitude belonging to each parallel; and the adjacent columns marked at the top, Miles, contain the geographic miles answering to a degree upon those parallels.

A Table shewing how many Miles answer to a Degree of Longitude, at every Degree of Latitude.

<table>
<thead>
<tr>
<th>D.L.</th>
<th>Miles</th>
<th>D.L.</th>
<th>Miles</th>
<th>D.L.</th>
<th>Miles</th>
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<tr>
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<td>36</td>
<td>48.55</td>
<td>54</td>
<td>37.05</td>
<td>72</td>
<td>17.93</td>
</tr>
</tbody>
</table>

Though
NAVIGATION

Though this table does only shew the miles answering to a degree of any parallel, whose latitude consists of a whole number of degrees; yet it may be made to serve for any parallel whose latitude is some number of degrees and minutes, by making the following proportion, viz.

As 1 degree, or 60 minutes, is to the difference between the miles answering to a degree in the next greater and next less tabular latitude than that proposed; so is the excess of the proposed latitude above the next tabular latitude, to a proportional part; which, subtracted from the miles answering to a degree of longitude in the next less tabular latitude, will give the miles answering to a degree in the proposed latitude.

Example. Required to find the miles answering to a degree on the parallel of 56° 44'.

First, The next less parallel of latitude in the table than the proposed is that of 56°, a degree of which (by the table) is equal to 33.85 miles; and the next greater parallel of latitude in the table, than that proposed, is that of 57°, a degree of which is (by the table) equal to 32.68 miles; the difference of these is 87, and the difference between these parallels is 1 degree or 60 minutes; also the distance between the parallel of 56° 44', is 44 minutes: then by the preceding proportion it will be, As 60 is to 87, so is 44 to 638, the difference between a degree on the parallel of 56° and a degree on the parallel of 56° 44'; which therefore taken from 33.55, the miles answering to a degree on the parallel of 56°, leaves 32.912, the miles answering to a degree on the parallel of 56° 44', as was required.

Case II. The distance failed in any parallel of latitude, or the distance between any two places on that parallel, being given, to find the difference of longitude.

Example. Suppose a ship in the latitude of 55° 30' north fails directly east 685.6 miles; required how much she has deviated her longitude.

By Cor. 4. Art. 1. of this section, it will be

As the cos of the lat. 55° 30' — 9.73202
so is the distance failed 685.6 — 2.93607
to min. of diff. long. 1213 — 3.08405
which reduced into degrees, by dividing by 60, makes 20° 15', the difference of longitude the ship has made.

This may also be solved by help of the foregoing table, viz. by finding from it the miles answering to a degree on the proposed parallel, and dividing with this the given number of miles, the quotient will be the degrees and minutes of difference of longitude required.

Thus in the last example; I find, from the foregoing table, that a degree on the parallel of 55° 36' is equal to 33.89 miles; by this I divide the proposed number of miles 685.6, and the quotient is 20.13 degrees, i.e. 20° 15', the difference of longitude required.

Case III. The difference of longitude between two places on the same parallel, and the distance between them, being given; to find the latitude of that parallel.

Example. Suppose a ship fails on a certain parallel directly west 624 miles, and then has differed her longitude 18° 46' or 1126 miles: Required the latitude of the parallel she failed upon.

By Cor. 3. Art. 1. of this section, it will be,

As the min. of diff. long. 1126 — 3.05154
so is the distance failed 624 — 2.79518
so is radius — — 10.00000
to the cos of the lat. 56° 21' — 9.74304
consequently the latitude of the ship or parallel she failed upon was 56° 21'.

From what has been said, may be solved the following problems.

Prob. I. Suppose two ships in the latitude of 46° 30' north, distant 654 miles, fail both directly north 256 miles, and consequently are come to the latitude of 50° 46' north: Required their distance on that parallel.

By Cor. 6. Art. 1. of this section, it will be,

As the cos of — 46° 30' — 9.83781
so is the distance failed — 654 — 2.81558
to — — 601 — 2.77680
the distance between the ships when on the parallel of 50° 46'.

Prob. II. Suppose two ships in the latitude of 45° 48' north, distant 846 miles, fail directly north till the distance between them is 624 miles: Required the latitude come to, and the distance failed.

By Cor. 5. Art. 1. of this section, it will be,

As their first distance — 846 — 2.94279
so is their second distance — 624 — 2.79518
so is the co-s of — 45° 48' — 9.84334
to the co-s of — 59° 04' — 9.71115
the latitude of the parallel the ships are come to.

Consequently to find their distance failed,

From the latitude come to — 59° 04'
subtract the latitude failed from, — 45° 48'
and there remains — — 13° 16'
equal to 796 miles, the difference of latitude or distance failed.

Sec. 4. Of Middle-latitude Sailing.

When two places lie both on the same parallel, we shew in the last section, how, from the difference of longitude given, to find the miles of easting or westing between them, & e contra. But when two places lie not on the same parallel, then their difference of longitude cannot be reduced to miles of easting or westing on the parallel of either place: for if counted on the parallel of that place that has the greatest latitude, it would be too small; and if on the parallel of that place having the least latitude, it would be too great. Hence the common way of reducing the difference of longitude between two places, lying on different parallels, to miles of easting or westing, & e contra, is by counting it on the middle parallel between the places, which is found by adding the latitudes of the two places together, and taking half the sum, which will be the latitude of the middle parallel required. And hence arises the solution of the following cases.

Case I. The latitudes of two places, and their difference of longitude, given; to find the direct course and distance.

Example,
EXAMPLE. Required the direct course and distance between the Lizard in the latitude of 50° 06' north, and longitude of 5° 14' west, and St Vincent in the latitude of 17° 10' N. and longitude of 24° 20' W.

First, To the latitude of the Lizard — 50°, 06' N.
add the latitude of St Vincent — 17°, 10
Then the sum is — 67°, 10 N.
Half the sum or latitude of the middle parallel is — 33°, 35' N.
Also the difference of latitude is equal to 1146 miles of southing. Again,
From the longitude of St Vincent — 24°, 20' W.
take the longitude of the Lizard — 05°, 14'
there remains — 16°, 06
equal to 1146 min. of diff. of long. west.

Then for the miles of southing, or departure, it will be, by Cafe 1. of Parallel Sailing,
As radius — 10.00000
is to the co-fine of the middle parallel — 33°, 35' — 9.92069
fo is the departure — 1146 — 3.05918
to the miles of wefting — 954.7 — 2.97987
And for the course it will be, by Cafe 4. of Plain Sailing,
As the diff. of lat. — 1970 — 3.29447
is to radius — 10.00000
so is the course — 954.7 — 2.97987
to the diff. of latitude — 1146 — 2.15229
which, because it is between south and west, it will be SSW 1/4 west nearly.

For the distance, it will be, by the same course,
As radius — 10.00000
is to the diff. of lat. — 1970 — 3.29447
so is the secant of the course — 25°, 51' — 9.68540

whence the direct course and distance from the Lizard to St Vincent is SSW 1/4 W. 2189 miles.

Case II. One latitude, course, and distance failed being given, to find the other latitude and difference of longitude.

EXAMPLE. Suppose a ship in the latitude of 50° 00' north, sails south 50° 06' west, 150 miles: Required the latitude the ship has come to, and how much she has differed her longitude.

First, For the difference of latitude, it will be, by Cafe 1. of Plain Sailing,
As radius — 10.00000
is to the distance — 150 — 2.17609
so is the line of the course — 50°, 06' — 9.88489
to the departure — 115.1 — 2.06098
As for the difference of longitude, it will be, by Case 2. of Plain Sailing,
As the course of the middle parallel 49° 1/2 — 9.81519
is to radius — 10.00000
fo is the departure — 115.1 — 2.06098
to the min. diff. of longitude — 176.1 — 2.24579
equal to 2° 56', which is the difference of longitude the ship has made westerly.

Case III. Course and difference of latitude given; to find the distance failed, and difference of longitude.

EXAMPLE. Suppose a ship in the latitude of 53° 34' north, fails SE5S, till by observation she is found to be in the latitude of 51° 12', and consequently has differed her latitude 2° 22' or 142 miles: Required the distance failed, and the difference of longitude.

First, For the departure, it will be (by Cafe 2. of Plain Sailing),
As radius — 10.00000
is to the diff. of latitude — 142 — 2.15229
so is the tang. of course — 33° 45' — 9.82489
to the departure — 94.8 — 1.97718
And for the distance it will be, by the same course,
As radius — 10.00000
is to the diff. of latitude — 142 — 2.15229
so is the secant of the course — 25° 06' — 10.08015
to the distance — 170.8 — 2.23244

Then, since the latitude failed from was 53° 34' north, and the latitude come to 51° 12' north; therefore the middle parallel will be 52° 23'; and consequently, for the difference of longitude, it will be (by Cafe 2. of Parallel Sailing)
As the course of the middle parallel — 52° 23' — 9.78560
is to the departure — 194.8 — 1.97718
so is radius — 10.00000
to min. of diff. of longitude — 145.5 — 2.19158
equal to 2° 35', the difference of longitude easterly.

Case IV. Difference of latitude and distance failed, given; to find the course and difference of longitude.

EXAMPLE. Suppose a ship in the latitude of 43° 26' north, fails between south and east, 246 miles, and then is found by observation to be in the the latitude of 41° 06' north: Required the direct course and difference of longitude.

First, For the course, it will be, by Cafe 3. of Plain Sailing.
As the distance — 246 — 2.39094
is to radius — 10.00000
so is the diff. of latitude — 140 — 2.14613
to the co-fine of the course — 55° 19' — 9.75519
which, because the ship fails between south and east, will be south 55° 19' east, or SE5E nearly.

Then for departure, it will be, by the same course,
As radius — 10.00000
is to the distance — 246 — 2.39094
1. To find the difference of longitude, it will be, by Case 6. of Plain Sailing,
   As the fine of the course -- 33°, 45' -- 9.74474
   is to the departure -- 123 -- 2.08991
   so is radius -- -- -- 10.00000
   to the distance -- 221.4 -- 2.24317

2. And for the difference of latitude it will be, by the same Case,
   As the tang. of course -- 33°, 45' -- 9.82489
   is to the departure -- 123 -- 2.08991
   so is radius -- -- -- 10.00000
   to the diff. of latitude -- 184 -- 2.26502
   which is equal to 3° 04', the difference of longitude westerly.

3. Case VI. Difference of latitude and departure given, to find course, distance, and difference of longitude.

4. Example. Suppose a ship in the latitude of 50° 46', north, fails between south and east 146 miles, and is then found by observation to be in the latitude of 43° 24' north; required the course, distance, and difference of longitude.

5. First, By Case 4. of Plain Sailing, it will be for the course,
   As the diff. of latitude -- 103 -- 2.28536
   is to departure -- 146 -- 2.16137
   so is radius -- -- -- 10.00000
   to the tang. of course -- 36°, 55' -- 9.87581
   which, because the ship is failing between south and east, will be south 36° 55' east, or SEE ½ east nearly.
   For the distance, it will be, by the same Case,
   As radius -- -- -- 10.00000
   to the diff. of latitude -- 103 -- 2.28536
   so is the secant of the course -- 36°, 55' -- 10.09718
   to the distance -- 241.4 -- 2.38774
   Then for the difference of longitude, it will be, by Case 2. of Parallel Sailing,
is to radius

so is the departure 126 to the tang. of the course 30°, 29' 9.76996

which, because it is between south and west, will be south 30° 20' west, or SSW 3/4 west nearly.

And for the distance, it will be, by the fame Case,

As radius is to the diff. of lat. 214. 2.33°4 2.32041

so is the secant of the course 30°, 29' 10.06461 to the distance 248.4 2.39502

2. From what has been faid, it will be easy to solve a traverse, by the rules of Middle Latitude Sailing.

Example. Suppose a ship in the latitude of 43° 25' north, fails upon the following courses, viz. SW/S 63 miles, SSW 1/4 west 45 miles, SE/E 54 miles, and SW/W 74 miles: Required the latitude the ship has come to, and how far she has differed her longitude.

First, By Case 2. of this Sect. find the difference of latitude and difference of longitude belonging to each course and distance, and they will stand as in the following table.

<table>
<thead>
<tr>
<th>Course</th>
<th>Distance</th>
<th>Diff. of Lat.</th>
<th>Diff. of Longit.</th>
</tr>
</thead>
<tbody>
<tr>
<td>SW/S</td>
<td>63</td>
<td>52.4</td>
<td>47.85</td>
</tr>
<tr>
<td>SSW 1/4W</td>
<td>45</td>
<td>39.7</td>
<td>28.62</td>
</tr>
<tr>
<td>SE/E</td>
<td>54</td>
<td>53.0</td>
<td>13.75</td>
</tr>
<tr>
<td>SW/W</td>
<td>74</td>
<td>41.1</td>
<td>81.08</td>
</tr>
</tbody>
</table>

Hence it is plain the ship has differed her latitude 186.2 minutes, or 3° 6' and so has come to the latitude of 40° 16' north, and has made of difference of longitude 143.8 minutes, or 2° 23' 48'' westerly.

The method of failing, though it be not strictly true, yet it comes very near the truth, as will be evident, by comparing an example wrought by this method with the same wrought by the method delivered in the next Section, which is strictly true; and it serves, without any considerable error, in runnings of 450 miles between the equator and parallel of 30 degrees, of 300 miles between that and the parallel of 60 degrees, and of 150 miles as far as there is any occasion, and consequently must be sufficiently exact for 24 hours run.

Sect. 5. Of Mercator's Sailing.

1. Though the meridians do all meet at the pole, and the parallels to the equator do continually decrease, and that in proportion to the co-fines of their latitudes; yet in old sea charts the meridians were drawn parallel to one another, and consequently the parallels of latitude made equal to the equator, and to a degree of longitude on any parallel as large as a degree on the equator; also in these charts the degrees of latitude were still represented (as they are in themselves) equal to each other, and to the degrees of the equator. By these means the degrees of longitude being increased beyond their just proportion, and the more so the nearer they approach the pole, the degrees of latitude at the same time remaining the same, it is evident places must be very erroneously marked down upon these charts with respect to their latitude and longitude, and consequently their bearing from one another very false.

2. To remedy this inconvenience, so as still to keep the meridians parallel, it is plain we must protrast, or lengthen, the degrees of latitude in the same proportion as those of longitude are, that so the proportion in sailing and wefting may be the same with that of southing and northering, and consequently the bearings of places from one another be the same upon the chart as upon the globe itself.

Let ABD (No. 11.) be a quadrant of a meridian, A the pole, D a point on the equator, AC half the axis, B any point upon the meridian, from which draw BF perpendicular to AC, and CG perpendicular to CD; then BF will be the line, and CG the co-fine of BD the latitude of the point B; draw D the tangent and CE the secant of the arch CD. It has been demonstrated in Sect. 3. that any arch of a parallel is to the like arch of the equator as the co-fine of the latitude of that parallel is to radius. Thus any arch as a minute on the parallel described by the point B, will be to a minute on the equator as BF is to CD; but since the triangles CGB and CDE are similar, therefore CG will be to CD as CG is to CE, i.e. the co-fine of any parallel is to radius as radius is to the secant of the latitude of that parallel.

But it has been just now shown, that the co-fine of any parallel is to radius, as the length of any arch as a minute on that parallel is to the length of the like arch on the equator; therefore the length of any arch as a minute on any parallel, is to the length of the like arch on the equator, as radius is to the secant of the latitude of that parallel; and so the length of any arch, as a minute on the equator, is longer than the like arch of any parallel in the same proportion, as the secant of the latitude of that parallel is to radius. But since in this projection the meridians are parallel, and consequently each parallel of latitude equal to the equator, it is plain the length of any arch as a minute on any parallel, is increased beyond its just proportion, at such rate as the secant of the latitude of that parallel is greater than radius; and therefore to keep up the proportion of northing and southing to that of easting and wefting, upon this chart, as it is upon the globe itself, the length of a minute upon the meridian at any parallel must also be increased beyond its just proportion at the same rate, i.e. as the secant of the latitude of that parallel is greater than radius. Thus to find the length of a minute upon the meridian at the latitude of 75 degrees, since a minute of a meridian is every where equal on the globe, and also equal to a minute upon the equator, let it be represented by unity: then making it as radius is to the secant of 75 degrees, so is unity to a fourth number, which is 3.864 nearly; and consequently, by whatever line you represent one minute on the equator of this chart, the length of one minute on the enlarged meridian
meridian at the latitude of 75 degrees, or the distance between the parallel of 75° 00' and the parallel of 75° 01', will be equal to 3 of these lines, and 1 of one of them. By making the same proportion, it will be found, that the length of a minute on the meridian of this chart at the parallel of 60°, or the distance between the parallel of 60° 00' and that of 60° 01', is equal to two of these lines. After the same manner, the length of a minute on the enlarged meridian may be found at any latitude; and consequently beginning at the equator, and computing the length of every intermediate minute between that and any parallel, the sum of all these shall be the length of a meridian intercepted between the equator and that parallel; and the distance of each degree and minute of latitude from the equator upon the meridian of this chart, computed in minutes of the equator, forms what is commonly called a table of meridional parts.

If the arch BD (No. 11) represent the latitude of any point B, then (CD being radius) CE will be the secant of that latitude: but it has been shown above, that radius is to the secant of any latitude, as the length of a minute upon the equator is to the length of a minute on the meridian of this chart at that latitude; therefore CD is to CE, as the length of a minute upon the equator is to the length of a minute upon the meridian, at the latitude of the point B. Consequently, if the radius CD be taken equal to the length of a minute upon the equator, CE, or the secant of the latitude, will be equal to the length of a minute upon the meridian at that latitude. Therefore, in general, if the length of a minute upon the equator be made radius, the length of a minute upon the enlarged meridian will be everywhere equal to the secant of the arch contained between it and the equator.

Con. 1. Hence it follows, since the length of every intermediate minute between the equator and any parallel, is equal to the secant of the latitude (the radius being equal to a minute upon the equator) the sum of all these lengths, or the distance of that parallel on the enlarged meridian from the equator, will be equal to the sum of all the secants, to every minute contained between that and any parallel; and the sum of all these divided into 10 equal parts will give the degree of each degree of latitude. Consequently, if the radius CD of the arch be taken equal to the length of a minute upon the equator, CE, or the secant of the latitude, will be equal to the length of a minute upon the meridian at that latitude. Therefore, in general, if the length of a minute upon the equator be made radius, the length of a minute upon the enlarged meridian will be everywhere equal to the secant of the arch contained between it and the equator.

Con. 2. Consequently, the distance between any two parallels on the same side of the equator, is equal to the difference of the sums of all the secants contained between the equator and each parallel, and the distance between any two parallels on contrary sides of the equator, is equal to the sum of the sums of all the secants contained between the equator and each parallel.

5. By the tables of meridional parts, which may be seen in Paton, and other writers on this subject, may be constructed the nautical chart, commonly called Mercator's chart. Thus, for example, let it be required to make a chart that shall commence at the equator, and reach to the parallel of 60 degrees, and shall contain 80 degrees of longitude.

Draw the line EQ representing the equator, (see No. 12) then take, from any convenient line of equal parts, 4800 (the number of minutes contained in 80 degrees,) which set off from E to Q, and this will determine the breadth of the chart.

Divide the line EQ into eight equal parts, in the points 10, 20, 30, &c. each containing 10 degrees, and each of these divided into 10 equal parts will give the degree of each degree upon the equator: then through the points E, 10, 20, &c. drawing lines perpendicular to EQ, these shall be meridians.

From the scale of equal parts take 4572.4 (the meridional parts answering to 60 degrees,) and let that off from E to A and from Q to B, and join AB: then this line will represent the parallel of 60, and will determine the length of the chart.

Again, from the scale of equal parts take 603.1 (the meridional parts answering to 10 degrees,) and let that off from E to 10 on the line EA; and through the point 10 draw 10, 10, parallel to EQ; and this will be the parallel of 10 degrees. The same way, setting off from E on the line EA, the meridional parts answering to each degree, &c. of latitude; and through the several points drawing lines parallel to EQ, we shall have the several parallels of latitude.

If the chart does not commence from the equator, but is only to serve for a certain distance on the meridian between two given parallels on the same side of the equator; then the meridians are to be drawn as in the last example: and for the parallels of latitude you are to proceed thus, viz. from the meridional parts answering to each point of latitude in your chart, subtract the meridional parts answering to the least latitude, and set off the differences severally, from the parallel of least latitude, upon the two extreme meridians; and the lines joining these points of the meridians shall represent the several parallels upon your chart.

Thus let it be required to draw a chart that shall serve from the latitude of 20 degrees north to 60 degrees north, and that shall contain 80 degrees of longitude.

Having drawn the line DC to represent the parallel of 20 degrees (see No. 12) and the meridians to it, as in the foregoing example; set off 663.3 (the difference between the meridional parts answering to 20 degrees, and those of 20 degrees) from D to 30, and from C to 30: then join the points 30 and 30 with a right line, and that shall be the parallel of 30. Also set off 1397.6 (the difference between the meridional parts answering to 40 degrees, and those of 20 degrees) from D to 40, and from C to 40, and joining the points 40 and 40 with a right line, that shall be the parallel of 40. And proceeding after the same way, we may draw as many of the intermediate parallels as we have occasion for.

But if the two parallels of latitude that bound the chart, are on the contrary sides of the equator; then draw a line representing the equator and meridians to it, as in the first example; and from the equator set off on each side of it the several parallels contained between it and the given parallels as above, and your chart is finished.

If Mercator's chart, constructed as above, hath its equator extended on each side of the point E 180 degrees, and if the several places on the surface of the earth be there laid down according to their latitudes and longitudes, we shall have what is commonly called Mercator's map of the earth. This map is not to be considered as a similar and just representation of the earth's surface; for in it the
figures of countries are distorted, especially near the poles: but since the degrees of latitude are everywhere increased in the same proportion as those of longitude are, the bearings between the places will be the same in this chart as on the globe; and the proportions between the latitudes, longitudes, and nautical distances, will also be the same on this chart, as on the globe itself; by which means the several cases of navigation are solved after a most easy manner, and adapted to the meanest capacities.

N.B. Here you must take notice, that in all charts, the upper part is the north side, and the lower part or bottom is the south side; also that part of it towards the right hand is the east, and that towards the left hand the west side of the chart.

6. Since, according to this projection, the meridians are parallel right lines; it is plain, that the rhombs which form always equal angles with the meridians, will be straight lines; which property renders this projection of the earth's surface much more easy and proper for use than any other.

7. This method of projecting the earth's surface upon a plane, was first invented by Mr Edward Wright, but first published by Mercator; and hence the failing by the chart, was called Mercator's failing.

8. In No. 13, let A and E represent two places upon Mercator's chart, AC the meridian of A, and CE the parallel of latitude passing through E; draw AE, and set off upon AC the length AB equal to the number of minutes contained in the difference of latitude between the two places, and taken from the same scale of equal parts the chart was made by, or from the equator, or any graduated parallel of the chart, and through B draw BD parallel to CE meeting AE in D. Then AC will be the enlarged difference of latitude, AB the proper difference of latitude, CE the difference of longitude, BD the departure, AE the enlarged distance, and AD the proper distance, between the two places A and E; also the angle BAD will be the course, and AE the rhomb line between them.

9. Now since in the triangle ACE, BD is parallel to one of its sides CE; it is plain the triangles ACE, ABD, will be similar, and consequently the sides proportional. Hence arise the solutions of the several cases in this failing, which are as follow.

Case I. The latitudes of two places given, to find the meridional or enlarged difference of latitude between them.

Of this case there are three varieties, viz. either one of the places lies on the equator, or both on the same side of it; or lastly, on different sides.

1. If one of the proposed places lies on the equator, then the meridional difference of latitude is found by subtracting the meridional parts answering to the least latitude from those answering to the greatest, and the difference is that required.

Example. Required the meridional difference of latitude between the Lizard in the latitude of 50° 00' north, and Antigua in the latitude of 17° 30' north.

From the meridional parts of — 50°, 00' 3474.5 subtract the meridional parts of 17°, 30' 1066.7

| Difference of latitude | 2407.8 |

2. If the two proposed places be on the same side of the equator, then the meridional difference of latitude is found by adding together the meridional parts answering to each latitude, and the sum is that required.

Example. Required the meridional difference of latitude between Antigua in the latitude of 17° 30' north, and Lima in Peru in the latitude of 12° 30' South.

To the merid. parts answering to 17°, 30' 1066.7 add these answering to — 12°, 30' 756.1

| Sum | 1822.8 |

3. If the places lie on different sides of the equator, then the meridional difference of latitude is found by adding together the meridional parts answering to each latitude, and the sum is that required.

Example. Required the meridional difference of latitude between the Lizard in the latitude of 50° 00' north, and Port-Royal in Jamaica in the latitude of 17° 40'; differing in longitude 70° 46', Port-Royal lying to far to the westward of the Lizard.

Preparation.

From the latitude of the Lizard — 50°, 00' subtract the latitude of Port-Royal — 17°, 40'

| Difference of latitude | 32°, 20' |

and there remains

| Difference of latitude | 32°, 20' |

and there remains

| Difference of latitude | 2397.3 |

Geometrically. Draw the line AC (No 14.) representing the meridian of the Lizard at A, and set off from A, upon that line, AE equal to 1940 (from any scale of equal parts) the proper difference of latitude, also AC equal to 2397 3 (from the same scale) the meridional or enlarged difference of latitude. Upon the point C raise CB perpendicular to AC, and make CB equal to 4246 the minutes of difference of longitude.

Join AB, and through E draw ED parallel to BC: so the case is constructed; and AD applied to the same scale of equal parts the other legs were taken from will give the direct distance, and the angle DAE measured by the line of chords will give the course.

By Calculation.

For the angle of the course EAD, it will be, (by Rectangular Trigonometry.)

\[ AC : CB :: R : T, BAC, \text{ i.e.} \]

As the meridional diff. of lat. 2397.3 — 3 37970 is
is to the difference of long. — 42°6.0 — 3.62798
so is radius — — — — 10.00000

to the tang. of the direct course 60° 33' — 10.24828
which, because Port Royal is southward of the Lizard,
and the difference of longitude westerly, will be south
60° 33' west, or SWW 1/2 west nearly.

Then for the distance AD, it will be, (by rectangular
trigonometry)
R : AE : : Sec. A : AD, i. e.
As the radius — — — — 10.00000
is to the proper diff. of lat. — 1940 — 3.28780
so is the secant of the course — 60° 33' — 10.30833
to the difference — 3945.6 — 3.59613
consequently the direct course and distance between the
Lizard and Port-Royal in Jamaica, is south 60° 33',
3945.6 miles.

Case III. Course and distance failed given, to find dif-
ference of latitude and difference of longitude.

Example. Suppose a ship from the Lizard in the lati-

tude of 50° 00' north, fails south 35° 40' west 156 miles.
Required the latitude come to, and how much she has al-
tered her longitude.

GEOMETRICALLY. 1. Draw the line BK (No. 15.)
representing the meridian of the Lizard at B; from B
draw the line BM, making with BK an angle equal to
35° 40', and upon this line set off BM equal to 156 the
given distance, and from M let fall the perpendicular MK
upon BK.

Then for BK the proper difference of latitude, it will be,
(by rectangular trigonometry),
R : MB : : S, BMK : BK,
i. e. As radius — — — — 10.00000
is to the distance — 156 — 2.19212
so is the cosine of the course 35° 40' — 9.00978
to the proper difference of lat. 127 — 2.10290
equal to 2° 07'; and since the ship is failing from a north
latitude towards the south, therefore the latitude come to
will be 47° 53' north. Hence the meridional difference
of latitude will be 193.4.

2. Produce BK to D, till BD be equal to 193 4
through D draw DL parallel to MK, meeting DM pro-
duced in L; then DL will be the difference of longitude:
to find which by calculation, it will be, (by rectangular
trigonometry),
R : BD : T, LBD : DL,
i. e. As radius — — — — 10.00000
is to the meridional diff. of lat. 193.4 — 2.28646
so is the tangent of the course 35° 40' — 9.85594
to minutes of diff. of long. — 138.8 — 2.14240
equal to 2° 18' 38'' the difference of longitude the ship
has made westerly.

Case IV. Given course and both latitudes, viz. the
latitude failed from, and the latitude come to; to find
the difference failed, and the difference of longitude.

Example. Suppose a ship in the latitude of 54° 20'
north, fails south 35° 45' east, until by observation she is
found to be in the latitude of 51° 45' north; required
the difference failed, and the difference of longitude.

GEOMETRICALLY. Draw AB (No. 16.) to repre-
sent the meridian of the ship in the first latitude, and set
off from A to B 155 the minutes of the proper difference of
latitude, also AG equal to 257.9 the minutes of the enlarged
difference of latitude. Through B and G, draw the lines
BC and GK perpendicular to AG; also draw AK making
with AG an angle of 30° 45', which will meet the two
former lines in the points C and K; so the case is con-
structed, and AC and GK may be found from the line of
equal parts: To find which,

By Calculation:
First, For the difference of longitude, it will be, (by
rectangular trigonometry),
R : AG : : T, GAK : GK,
i. e. As radius — — — — 10.00000
is to the enlarged diff. of lat. — 257.9 — 2.41143
so is the tangent of the course — 33°, 45' — 9.82489
to min. of diff. of longitude — 172 3 — 2.23034
equal to 2° 52' 18'', the difference of longitude the ship
has made easterly.

This might also have been found, by first finding the
departure BC (by Case 2. of Plain Sailing,) and then it
would be
AB : BC : : AG : GK, the difference of longitude
required.

Then for the direct distance AC, it will be, (by rect-
angular trigonometry),
R : AB : : Sec. A : AC,
i. e. As radius — — — — 10.00000
is to the proper diff. of lat. — 155 — 2.19033
so is the secant of the course — 33°, 45' — 10.08015
to the direct distance — 186.4 — 2.27048
consequently the ship has failed south 33° 45' east
186.4 miles, and has differed her longitude 2° 52' 18''
easterly.

Case V. Both latitudes, and distance failed, given;
to find the direct course, and difference of longitude.

Example. Suppose a ship from the latitude of 45°
26' north, fails between north and east 195 miles, and
then by observation she is found to be in the latitude of
48° 06' north; required the direct course and difference
of longitude.

GEOMETRICALLY. Draw AB (No. 17.) equal to
160 the proper difference of latitude, and from the point
B raise the perpendicular BD; then take 195 in your
compasses, and letting one foot of them in A, with the o-
ther cross the line BD in D. Produce AB, till AC be equ-

tal to 233.6 the enlarged difference of latitude. Thro' C
draw CK parallel to BD, meeting AD produced in K:
so the case is constructed; and the angle A may be me-
sured by the line of chords, and CK by the line of equal
parts: To find which,

By Calculation:
First, For the angle of the course BAD it will be, (by
rectangular trigonometry)
AB : R : : AD : Sec. A. i. e.
As the proper diff. of lat. — 160 — 2.26412
is to radius — — — — 10.00000
so is the distance — 195 — 2.29003
to the secant of the course — 34°, 52' — 10.08351
which, because the ship is failing between north and
east, will be north 34° 52' east, or NEE in 19° 47' easterly.

Then for the difference of longitude, it will be, (by
rectangular trigonometry),
5 C
NAVIGATION.

GEOMETRICALLY. 1. Having drawn the meridian AB, (No. 19.) make the angle BAD equal to 42° 33'. Draw FD parallel to AB at the distance of 116. which will meet AD in D. Let fall upon AB the perpendicular DB. Then AB will be the proper difference of latitude, and AD the direct distance: To find which by calculation, first, for the distance AD it will be, (by rectangular trigonometry)

\[
\frac{S}{A} : \frac{BD}{R} = \frac{AD}{R}
\]

i. e. As radius \[10.00000\]
is to the proper diff. of latitude \[212.2 \ 2.10165\]
fo is the tang. of the course \[42°, 33' \ 9.82010\]
to the direct distance \[116 \ 2.06446\]

Then for the proper difference of latitude, it will be, by rectangular trigonometry

\[
\frac{T}{A} : \frac{BD}{R} = \frac{AD}{R}
\]

i. e. As the tang. of the course \[42°, 33' \ 9.66281\]
is to the departure \[116 \ 2.06446\]
fo is radius \[10.00000\]
to the proper difference of latitude \[126.4 \ 2.10165\] equal to 2° 6'. Consequently the ship has come to the latitude of 52° 20' north, and so the meridional difference of latitude will be 212.2.

2. Produce AB to E, till AE be equal to 212.2; and through E draw EC parallel to BD, meeting AD produced in C; then EC will be the difference of longitude; to find which by calculation, it will be, (by rectangular trigonometry)

\[
\frac{R}{AE} = \frac{T}{A}
\]

i. e. As radius \[10.00000\]
is to the merid. diff. of latitude \[212.2 \ 2.32675\]
fo is the tang. of the course \[42°, 33' \ 9.66281\]
to the min. of diff. of longitude \[194.8 \ 2.28556\] equal to 3° 14' 48'' the difference of longitude easterly.

This might have been found otherwise thus: because the triangles ACE, ADB, are similar; therefore it will be,

\[
\frac{AB}{BD} = \frac{AE}{EC}
\]

i. e. As the proper diff. of latitude \[126.4 \ 2.10165\] is to the departure \[116 \ 2.06446\]
fo is the enlarged diff. of latitude \[212.2 \ 2.32675\] to min. diff. of longitude \[194.8 \ 2.28556\]

CASE VIII. Both latitudes and departure given, to find course, distance, and difference of longitude.

Example. Suppose a ship from the latitude of 46° 20' N. fails between south and west, till she has made of departure 126.4 miles; and is then found by observation to be in the latitude of 43° 25' north. Required the course and distance failed, and difference of longitude.

Geometrically. Draw AK (No. 20.) to represent the meridian of the ship in her first latitude; set off upon it AC, equal to 165, the proper difference of latitude. Draw BC perpendicular to AC, equal to 126.4 the departure, and join AB. Set off from A, AK equal to 233.3, the enlarged difference of latitude; and through K draw KD parallel to BC, meeting AB produced in D; fo the case is constructed, and DK will be the difference of longitude, AB the distance, and the angle A the course; to find which.

By Calculation:

First, For DC the difference of longitude, it will be,

\[
AC = \frac{R}{AE}
\]

de 

Example. Suppose a ship fails from the latitude of 54° 36' north, south 42° 33' east, until she has made of departure 116 miles. Required the latitude she is in, her direct distance failed, and how much she has altered her longitude.
NAVIGATION.

AC : CB : AK : KD.
i.e. As the proper diff. of latitude 165 2.21748
is to the departure — — 126.4 2.10175
so is the enlarged diff. of latitude — 233.3 2.36791
to min. of diff. longitude — 178.7 2.25218
equal to $3^\circ 56' 42''$, the difference of longitude westerly.

Then for the course it will be, (by rectangular trigonometry,)

$AC : BC : R : T$.

i.e. As the proper diff. of latitude 165 2.21748
is to the departure — — 126.4 2.10175
so is radius — — 10.00000
to the tangent of the course $37^\circ, 27'$ 9.88427
which, because the ship sails between south and west,
will be south $37^\circ 27'$ west, or SWS $6^\circ 30'$ westerly.

Lastly, For the distance AB; it will be, (by rectangular trigonometry,)

i.e. As the sine of the course $37^\circ, 27'$ 9.78399
is to the departure — — 126.4 2.10175
so is radius — — 10.00000
to the direct distance — 207.9 2.31780

Case IX. One latitude, distance failed, and departure given; to find the other latitude, difference of longitude, and course.

Example. Suppose a ship in the latitude of $40^\circ 00'$, north, fails between south and east 138 miles, and has then made of departure $112.6$. Required the latitude come to, the direct course, and difference of longitude.

Geometrically. First, Draw $BD$ (No. 21.) for the meridian of the ship at $B$; and parallel to it draw $FE$, at the distance of $112.6$, the departure. Take $138$, the distance, in your compasses, and fixing one point of them in $B$, with the other cross the line $FE$ in the point $E$; then join $B$ and $E$, and from $E$ let fall upon $BD$ the perpendicular $ED$; so $BD$ will be the proper difference of latitude, and the angle $B$ will be the course; to find which, by calculation,

First, for the course it will be, (by rectangular trigonometry,)

i.e. As the proper diff. of latitude 79.8 1.90180
is to the departure — — 112.6 2.05154
so is the enlarged diff. of latitude — 117.7 2.07073
to the diff of longitude — 166.1 2.22044
equal to $2^\circ 46' 06''$, the difference of longitude easterly.

9. From what has been said, it will be easy to solve a traverse according to the rules of Mercator's failing.

Example. Suppose a ship at the Lizard in the latitude $50^\circ 00'$, north, is bound to the Madera in the latitude of $32^\circ$, $20'$ north, the difference of longitude between them being $11^\circ 40'$, the west end of the Madera lying so much to the westward of the Lizard, and consequently the direct course and distance (by Case 2. of this Sect.) is south $26^\circ 15'$ west 1181.9 miles; but by reason of the winds she is forced to sail on the following courses (allowance being made for lee-way and variation, &c.) viz. SSW 44 miles, SWS $\frac{1}{2}$ west 36 miles, SWS 56 miles, and S&E 28 miles. Required the latitude the ship is in, her bearing and distance from the Lizard, and her direct course and distance from the Madera, at the end of these courses.

The geometrical construction of this traverse is performed by laying down the two ports according to construction of Case 2. of this Sect. and the several courses and distances according to Case 3. by which we have the following solution by calculation.

1. Course SSW, distance 44 miles.

For difference of latitude:

As radius — — 10.00000
is to the distance — 44 1.64345
so is the sine of the course $22^\circ, 30'$ 9.96562

to the difference of latitude — 40.5 1.60907
and since the course is sountherly, therefore the latitude come to will be $49^\circ 20'$ north, and consequently the meridional difference of latitude will be $61.8$. Then

For difference of longitude,

As radius — — 10.00000
is to the enlarged diff. of lat. $61.8$ 1.79099
so is the tangent of the course $22^\circ, 30'$ 9.01722
to min of diff of longitude $25.6$ 1.40821

2. Course SWS, distance 36 miles.

For difference of latitude:

As radius — — 10.00000
is to the distance — 36 1.55630
so is the sine of the course $16^\circ, 52'$ 9.98990

to the difference of latitude $34.46$ 1.53726
and since the course is southerly, therefore the latitude comes to will be $48^\circ 45'$. Hence the meridional difference of latitude will be $53.4$. Then

For difference of longitude:

As radius — — 10.00000
is to the enlarged diff. of lat. $53.4$ 1.72754
so is the tangent of the course $16^\circ, 52'$ 9.48171
to the difference of longitude $16.19$ 1.20925

3. Course SW&S, distance 56 miles.

For difference of latitude:

As radius — — 10.00000
is to the distance — 56 1.74819
so is the sine of the course $33^\circ, 45'$ 9.91985

2dly, Produce $B$ to $A$, till $BA$ be equal to $117.7$; and through $A$ draw $AC$ parallel to $DE$, meeting $BE$ produced in $C$; then $AC$ will be the difference of longitude; to find which by calculation, it will be,
NAVIGATION

to the difference of latitude — 46° 56' 1.66846
consequently the latitude come to is 47° 59', and therefore the enlarged difference of latitude will be 69.2.

Then,

For difference of longitude:

As radius — 10.00000
is to the enlarged diff. of lat. 69.2 1.84011
so is the tang. of the course 33° 45' 9.83469
to the difference of longitude 46.24 1.66500

4. Course S8E, distance 28 miles.
For difference of latitude:

As radius — 10.00000
is to the distance 28 1.44716
so is the co-sine of the course 11° 15' 9.99157
to the difference of latitude 8.59 0.93414
consequently the latitude come to will be 47°, 15'; and hence the meridional difference of latitude will be 43.2.

Then,

For difference of longitude:

As radius — 10.00000
is to the enlarged diff. of lat. 43.2 1.62548
so is the tang. of the course 11° 15' 9.99866
to the diff. of longitude 8.59 0.93414

Now these several courses and distances, together with the difference of latitude and longitude belonging to each of them, being set down in their proper columns in the Traverse Table, will stand as follow.

<table>
<thead>
<tr>
<th>Courses</th>
<th>Distances</th>
<th>Diff. of Lat.</th>
<th>Diff. of Long.</th>
</tr>
</thead>
<tbody>
<tr>
<td>SSW</td>
<td>44</td>
<td>N 40.65</td>
<td>S 25.6</td>
</tr>
<tr>
<td>S8W§W</td>
<td>36</td>
<td>N 34.46</td>
<td>S 16.19</td>
</tr>
<tr>
<td>SW&amp;8</td>
<td>56</td>
<td>N 46.56</td>
<td>S 49.24</td>
</tr>
<tr>
<td>S8E</td>
<td>28</td>
<td>N 27.46</td>
<td>S 8.59</td>
</tr>
<tr>
<td>Diff. of Lat.</td>
<td>149.13</td>
<td>S 8.59</td>
<td>E 8.59</td>
</tr>
<tr>
<td>Diff. of Long.</td>
<td>79.44</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Hence it is plain that the ship has made of southing 149.13 minutes, and consequently has come to the latitude of 47° 31' north, and so the meridional difference of latitude between that and her first latitude will be 226.1; and since she has made of difference of longitude 79.44 minutes westerly; therefore for the direct course and distance between the lizard and the ship it will be, (by Cache 2. of this Section.)

For the direct course:

As the merid. diff. of latitude 226.1 — 2.35430
is to radius — 10.00000
so is the difference of longitude 79.44 1.90004
to the tang. of the course — 9.54579
which because the difference of latitude is southerly, and the difference of longitude westerly, will be southerly 9.54579, or S8E 8° 7' westerly. Then,

For the direct distance:

As radius — 10.00000
is to the proper diff. of lat. 149.13 2.17349
so is the secant of the course 19° 22' 10.02530
to the direct distance — 158 2.19879
From the latitude the ship is in — 47°, 31' N
subtract the lat. of the Madera — 32°, 20' N

and there remains — 15°, 11'
equal to 911 minutes, the proper difference of latitude between the ship and the Madera.

Again, from the merid. parts answering to the latitude the ship is in

Take the meridional parts answering to the latitude of the Madera

and there remains 1196.4
the enlarged difference of latitude between the ship and the Madera.

Also, from the diff. of long. between the Lizard and the Madera

Take the difference of long. between the Lizard and the ship

and there remains 10°, 20.44 W
equal to 620.36 min. of difference of longitude between the ship and the Madera westerly.

Then for the direct course and distance between the ship and the Madera, it will be,

For the direct course:

As the merid. diff. of latitude 1196.4 — 3.07788
is to radius — 10.00000
so is the difference of longitude 620.36 2.79278
to the tang. of the course — 27°, 25' 9.71493
For the direct distance:

As radius — 10.00000
is to the proper diff. of latitude 911 2.95952
so is the secant of the course 27°, 25' 10.05174
to the direct distance — 1027 3.0126

10. It is very common, in working a day's reckoning at sea, to find the difference of latitude and departure to each course and distance; and adding all the departures together, and all the differences of latitudes for the whole departure, and difference of latitude made good that day, from thence (by Case 8. of this Section) to find the difference of longitude, &c. made good that day. Now that this method is false, will evidently appear, if we consider that the fame departure reckoned on two different parallels will give unequal differences of longitude; and consequently, when several departures are compounded together and reckoned on the fame parallel, the difference of longitude resulting from that cannot be the same with the sum of the differences of longitude resulting from the several departures on different parallels; and therefore we have chosen, in the [example of a traverse, to find the difference of longitude answering to each particular course and distance, the sum of which must be the true difference of longitude made good by the ship on thefe several courses and distances.

11. We shewed, at Art. 5. of this Section, how to construct a Mercator's chart; and now we shall proceed to its several uses, contained in the following problems.

Prob. 1. Let it be required to lay down a place upon
N A V I G A T I O N.

The chart, its latitude, and the difference of longitude between it and some known place upon the chart being given.

Example. Let the known place be the Lizard lying on the parallel of 50° 00' north, its meridian. Set off AE from E upon the equator EQ, towards Q, which will reach from E to F. Through F draw the meridian FG, and this will be the meridian of St Katharines; then set off from Q to H upon the graduated meridian QB, 28 degrees; and through H draw the parallel of latitude HM, which will meet the former meridian in K, the place upon the chart required.

Prob. II. Given two places upon the chart, to find their difference of latitude and difference of longitude.

Through the two places draw parallels of latitude; then the distance between these parallels numbered in degrees and minutes upon the graduated meridian will be the difference of latitude required; and through the two places drawing meridians, the distance between these, counted in degrees and minutes on the equator or any graduated parallel, will be the difference of longitude required.

Prob. III. To find the bearing of one place from another upon the chart.

Example. Required the bearing of St Katharines at K, (see No. 12.) from the Lizard at L.

Draw the meridian of the Lizard AE, and join K and L with the right line KL; then by the line of chords measuring the angle KLE, and with that entering the tables; we shall have the thing required.

This may also be done, by having compasses drawn on the chart (suppose at two of its corners); then lay the edge of a ruler over the two places, and let fall a perpendicular, or take the nearest distance from the centre of the compass next the first place, to the ruler's edge; then with this distance in your compasses, slide them along by the ruler's edge, keeping one foot of them close to the ruler, and the other as near as you can judge perpendicular to it, which will describe the rhomb required.

Prob. IV. To find the distance between two given places upon the chart.

This problem admits of four cases, according to the situation of the two places with respect to one another.

Case I. When the given places lie both upon the equator.

In this case their distance is found by converting the degrees of difference of longitude intercepted between them into minutes.

Case II. When the two places lie both on the same meridian.

Draw the parallels of those places; and the degrees upon the graduated meridian, intercepted between those parallels, reduced to minutes, give the distance required.

Case III. When the two places lie on the same parallel.

Example. Required to find the distance between the points K and N, (see No. 12.) both lying on the parallel of 28° 00' north. Take from your scale the chord of 60°, or radius in your compasses, and with that extent on KN as a base make the isosceles triangle KPN; then take from the line of lines the co-line of the latitude, or fine of 72° and set that off from P to S and T. Join S and T with the right line ST, and that applied to the graduated equator will give the degrees and minutes upon it equal to the distance; which, converted into minutes, will be the distance required.

The reason of this is evident from the section of Parallel Sailing; for it has been there demonstrated, that radius is to the co-line of any parallel, as the length of any arch on the equator, to the length of the same arch on that parallel. Now in this chart KN is the distance of the meridians of the two places K and N upon the equator; and since, in the triangle PNK, ST is the parallel to KN, therefore PN:PT::NK:TS. Consequently TS will be the distance of the two places K and N upon the parallel of 28°.

If the parallel the two places lie on be not far from the equator, and they not far asunder; then their distance may be found thus. Take the distance between them in your compasses, and apply that to the graduated meridian, so as the one foot may be as many minutes above, as the other is below the given parallel; and the degrees and minutes intercepted, reduced to minutes, will give the distance.

Or it may also be found thus. Take the length of a degree on the meridian at the given parallel, and turn that over on the parallel from the one place to the other, as oft as you can; then as oft as that extent is contained between the places, so many times 60 miles will be contained in the distance between them.

Case IV. When the places differ 60 miles.

Example. Suppose it were required to find the distance between the two places a and e upon the chart.

By

Prob. II. Find the difference of latitude between them; and take that in your compasses from the graduated equator, which set off on the meridian of a, from a to b; then through b draw be parallel to de; and taking ac in your compasses, apply it to the graduated equator, and it will shew the degrees and minutes contained in the distance required, which multiplied by 60 will give the miles of distance.

The reason of this is evident from Art. 8. of this Sect. for it is plain ad is the enlarged difference of latitude, and ab the proper; consequently ac the enlarged distance, and ac the proper.

Prob. V. To lay down a place upon the chart, its latitude and bearing from some known place upon the chart being known, or (which is the same) having the course and difference of latitude that a ship has made, to lay down the running of the ship, and find her place upon the chart.

Example. A ship from the Lizard in the latitude of 50° 00' north, sails SSW till she has differed her latitude 36° 40'. Required her place upon the chart.

Count from the Lizard at L. on the graduated meridian downwards (because the course is southerly) 36° 40' to H; through
through which draw a parallel of latitude, which will be the parallel the ship is in; then from L draw a SSW line Lf, cutting the former parallel in f, and this will be the ship's place upon the chart.

**Prob. VI.** One latitude, course, and distance, failed, given; to lay down the running of the ship, and find her place upon the chart.

*Example.* Suppose a ship at a in the latitude of 20° 00' north, sails north 37° 20', east 191 miles: Required the ship's place upon the chart.

Having drawn the meridian and parallel of the place a, set off upon it the rhomb line ae, making with ab an angle of 37° 20'; and upon it set off 191 from a to e; through c draw the parallel eb; and taking ab in your compasses, apply it to the graduated equator, and observe the number of degrees it contains; then count the same number of degrees on the graduated meridian from C to b, and through b draw the parallel he, which will cut ac produced in the point e, the ship's place required.

**Prob. VII.** Both latitudes and distance failed, given; to find the ship's place upon the chart.

*Example.* Suppose a ship fails from a, in the latitude of 20° 00' north, between north and east 191 miles, and is then in the latitude of 45° 00' north: Required the ship's place upon the chart.

Draw de the parallel of 45°, and set off upon the meridian of a upwards, ab equal to the proper difference of latitude taken from the equator or graduated parallel. Through b draw bc parallel to de; then with 191 in your compasses, fixing one foot of them in a, with the other crofs b c in c. Join a and c with the right line ac, which produced will meet de in e, the ship's place required.

**Prob. VIII.** One latitude, course and difference of longitude, given; to find the ship's place upon the chart.

*Example.* Suppose a ship from the Lizard in the latitude of 50° 00' north, sails SW&W, till her difference of longitude is 42° 36': Required the ship's place upon the chart.

Having drawn AE the meridian of the Lizard at L, count from E to F upon the equator 42° 36'; and through F draw the meridian EG; then from L draw the SW&W line LK, and where this meets FG, as at K, will be the ship's place required.

**Prob. IX.** One latitude, course, and departure, given; to find the ship's place upon the chart.

*Example.* Suppose a ship at a in the latitude of 20° 00' north, fails north 37° 20' east, till she has made of departure 116 miles: Required the ship's place upon the chart.

Having drawn the meridian of a, at the distance of 116, draw parallel to it the meridian k l. Draw the rhomb line ae, which will meet k l in some point c; then through c draw the parallel eb, and a b will be the proper difference of latitude, and b c the departure. Take a b in your compasses, and apply it to the equator or graduated parallel; then observe the number of degrees it contains, and count so many on the graduated meridian from C upwards to b. Through b draw the parallel he, which will meet ac produced in some point as e, which is the ship's place upon the chart.

**Prob. X.** One latitude, distance, and departure, given; to find the ship's place upon the chart.

*Example.* Suppose a ship at a in the latitude of 20° 00' north, sails 116 miles between north and east, and then is found to have made of departure 116 miles: Required the ship's place upon the chart.

Having drawn the meridian and parallel of the place a, set off upon the parallel a m equal to 116, and through m draw the meridian k l. Take the given distance 116 in your compasses; letting one foot of them in a, with the other crofs k l in e. Join a e, and through e draw the parallel eb; so eb will be the departure, and ab the proper difference of latitude; then proceeding with this, as in the foregoing problem, you will find the ship's place to be e.

**Prob. XI.** The latitude failed, difference of latitude, and departure, given; to find the ship's place upon the chart.

*Example.* Suppose a ship from a in the latitude of 20° 00' north, sails between north and east, till she be in the latitude of 45° 00' north, and is then found to have made of departure 116 miles: Required the ship's place upon the chart.

Having drawn the meridian of a, set off upon it, from a to b, 25 degrees, (taken from the equator or graduated parallel,) the proper difference of latitude; then thro' b draw the parallel b c, and make b c equal to 116 the departure, and join a c. Count from the parallel of a on the graduated meridian upwards to b 25 degrees, and through b draw the parallel e b, which will meet ac produced in some point e, and this will be the place of the ship required.

12. In the section of Plain Sailing it is plain that the terms meridional distance, departure, and difference of longitude, were synonymous, constantly signifying the same thing: which evidently followed from the supposition of the earth's surface being projected on a plane, in which the meridians were made parallel, and the degrees of latitude equal to one another and to those of the equator. But since it has been demonstrated (in this section) that if, in the projection of the earth's surface upon a plane, the meridians be made parallel, the degrees of latitude must be unequal, still increasing the nearer they come to the pole. It follows that these terms must denote lines really different from one another.

**Sect. 6. Of Oblique Sailing,**

The questions that may be propofed on this head being innumerable, we shall only give a few of the most useful.

**Prob. I.** Coafting along the shore, I saw a cape bear from me NNE; then I fowed away NW&W 20 miles, and I observed the fame cape to bear from me NE&NE. Required the distance of the ship from the cape at each fation.

**Geometrically.** Draw the circle NWSE (No. 22.) to repreffent the compafs, NS the meridian, and WE the eaf't and weft line, and let C be the place of the ship in her first fation; then from C let off upon the NW&W line, CA 20 miles, and A be the place of the ship in her second fation.
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From C draw the NNE line CB, and from A draw AB parallel to the NEW line CD, which will meet CB in the place of the cape, and CB will be the distance of it from the ship in its first station, and AB the distance in the second: to find which,

By Calculation:

In the triangle ABC are given AC, equal to 20 miles; the angle ACB, equal to 73° 45', the distance between the NNE and NW line; also the angle ABC, equal to 39° 22', the distance between the NNE and SSW line; and consequently the angle A, equal to 69° 30'.

Hence for CB, the distance of the cape from the ship in her first station, it will be (by oblique trigonometry)

\[ S \text{. ABC : AC :: S. BAC : CB} \]

\[ i. e. \text{ As the sine of } 
\frac{1}{2} \text{ the sum of sides AC and CB } 37^\circ 22' \quad 9.91417 \]

\[ \text{the distance from the ship at the first station.} \]

Then for AB, it will be, by oblique trigonometry,

\[ S \text{. ABC : AC :: S. BAC : AB} \]

\[ i. e. \text{ As the sine of } 
\frac{1}{2} \text{ the difference of sides 12.71 } 1.10415 \]

\[ \text{the distance of the cape from the ship at her second station.} \]

By Calculation:

In the triangle ABC are given AC, equal to 20 miles; the angle ACB, equal to 73° 45', the distance between the NNE and NW line; also the angle ABC, equal to 39° 22', the distance between the NNE and SSW line; and consequently the angle A, equal to 69° 30'.

Hence for CB, the distance of the cape from the ship at her first station.

\[ S \text{. ABC : AC :: S. BAC : CB} \]

\[ i. e. \text{ As the sine of } 
\frac{1}{2} \text{ the sum of sides AC and CB } 37^\circ 22' \quad 9.91417 \]

\[ \text{the distance from the ship at the first station.} \]

Then for AB, it will be, by oblique trigonometry,

\[ S \text{. ABC : AC :: S. BAC : AB} \]

\[ i. e. \text{ As the sine of } 
\frac{1}{2} \text{ the difference of sides 12.71 } 1.10415 \]

\[ \text{the distance of the cape from the ship at her second station.} \]

Prob. III. Coasting along the shore, I saw two headlands; the first bore from me NW from the second NNE; then standing away E by N 15° northerly 20 miles; I found the first bore from me WN, and the second N 22° westerly. Required the bearing and distance of these two headlands.

Geometrically. Having drawn the compasses NWSE (No. 24.) let C represent the first place of the ship; from which draw the NW line CB, and the NNE line CD, also the ENE line CA, which make equal to 20. From A draw AB parallel to the WNW line, and AD parallel to the NW line meeting the two first lines in the points B and D; then B will be the first and D the second headlands. Join the points B and D, and BD will be the distance between them, and the angle CDB the bearing from the NNE line: to find which

By Calculation:

1. In the triangle ABC are given the angle BCA, equal to 106° 04', the distance between the WNW line, and the ENE line; the angle ABC, equal to 30° 30', the distance between the WSW line, and the NNE line; the angle BAC, equal to 59° 22', the distance between the WSW line, and the SW line; also the side CA equal to 20 miles; whence for CB, it will be (by oblique trigonometry)

\[ \frac{1}{2} \text{ the sum of sides } AC \quad 9.80228 \]

\[ \text{the distance between the first headland and the ship in her first station.} \]

2. In the triangle ACD, are given the angle ACD, equal to 47° 49', the distance between the ENE line, and the NEE line; the angle CAD, equal to 92° 49', the distance between the WSW line, and the NWW line, the angle CDA equal to 39° 22', the distance between the S line, and the S line; also the side CA equal to 20 miles.

Hence for CD, it will be (by oblique trigonometry)

\[ \frac{1}{2} \text{ the difference of sides } 9.80228 \]

\[ \text{the distance between the second headland and the ship in her first station.} \]

3. In the triangle BCD, are given BC 18.79, CD 9.99960, and the angle BCD, equal to 59° 22', the distance between the NEE line, and the NNE line.

Hence for the angle CDB, it will be (by oblique trigonometry)

\[ \frac{1}{2} \text{ the difference of sides } 1.49835 \]

\[ \text{the distance between the second headland and the ship in her first station.} \]
To is the fine of BCD — 56° 15' — 9.91985

to BD — 26° 21' — 1.41843

distance between the two headlands.

This, and the first problem, are of great use in drawing the plot of any harbour, or laying down any sea coast.

Suppose a ship that makes her way good within 6 ¼ points of the wind, at north, is bound to a port bearing east 86 miles distance from her: Required the course and distance upon each tack, to gain the intended port.

**Geometrically.** Having drawn the compass NE SW, (No. 25.) let C represent the ship's place, and set off upon the east line CA 86 miles, so A will be the intended port. Draw CD and CB on each side of the north line at 6 ¼ points distance from it, and through A draw AB parallel to CD meeting CB in B; then the ENE ¼ E line CB, will be the course of the ship upon the starboard tack, and CB its distance on that tack; also the ESE ¼ E line AB, will be the course on the larboard tack, and BA the distance on that tack: to find which

**By Calculation:**

In the triangle ABC are given, the angle ACB, equal to 160°, 53', the distance between the east and ENE ¼ E line; the angle CBA, equal to 146° 14', the distance between the ENE ¼ E and the WNW ¼ W lines; the angle BAC equal to 16° 53', the distance between the east and ESE ¼ E lines; also AC 86 miles.

Hence since the angle at A and C are equal, the legs CB and BA will likewise be equal; to find either of which (suppose CB) it will be (by oblique angled trigonometry.)

As the fine of B — 146°, 14' — 9.74493

is to AC — 86 — 1.93450

so is the fine of A — 16°, 53' — 9.46393

to CB — 44°, 94' — 1.65260

distance the ship must sail on each tack.

There is a great variety of useful questions of this nature that may be proposed; but the nature of them being better understood by practice at sea, we shall leave them, and go on to Current Sailing.

**Sect. 7. Concerning Currents, and how to make proper allowances.**

**1. Currents** are certain settings of the stream by which all bodies (as ships, &c.) moving therein, are compelled to alter their course or velocity, or both; and submit to the motion impressed upon them by the current.

**Case I.** If the current sets just with the course of the ship, (i.e.) moves on the same rhomb with it; then the motion of the ship is increased, by as much as is the drift or velocity of the current.

**Example.** Suppose a ship fails SE 8 at the rate of 6 miles an hour, in a current that sets NNE 6 miles an hour: Required the ship's true rate of failing.

Here it is evident that the ship's true rate of failing will be 8 miles an hour.

**Case II.** If the current sets directly against the ship's course, then the motion of the ship is lessened by as much as is the velocity of the current.

**By Calculation:**

As the apparent distance AD — 96 — 1.98227

is to the current's motion DC — 45 — 1.65321

so is radius — — 10.0000

to the tangent of the true course DAC — — 25°, 07' — 9.67094

consequently the ship's true course is S 25°, 07' E, or SSE 2° 39', easterly.

Then for the true distance AC, it will be, (by rectangular trigonometry.)

As the fine of the course A — 25°, 07' — 9.62784

is to the departure DC — 45 — 1.65321

so is radius — — 10.0000

to the true distance AC — — 106 — 2.02357

**Example.** Suppose a ship fails SE 120 miles in 20 hours, in a current that sets WNW at the rate of 2 miles an hour: Required the ship's true course and distance failed in that time.
NAVIGATION.

Geometrically. Having drawn the compas NESW (No. 27.) let C represent the place the ship failed from; draw the SE line CA, which make equal to 120°; then will A be the place the ship capest at.

From A draw AB parallel to the WNE line CD, equal to 40°, the motion of the current in 20 hours, and join CB; then B will be the ship's true place at the end of 20 hours, CB her true distance, and the angle SCB her true course. To find which

By Calculation;

In the triangle ABC, are given CA 120, AB 40, and the angle CAB equal to $43° 45'$, the distance between the ENE and SE lines, to find the angles B and C, and the side CB.

First, For the angles C and B, it will be, (by oblique trigonometry)

As the sum of the sides CA and AB 160 — 2.20412 is to their difference 80 — 1.90309
so is the tang. of half the sum $73°, 07'$ 10.51783
to the tang. of half their differ. $59°, 45'$ 10.21680
consequently the angle ABC will be $131°, 52'$, and the angle ACB $14°, 23'$. Hence the true course is S $30°, 27'$ E, or SSE $2°, 07'$ westerly.

Then for the true distance CB, it will be, (by oblique trigonometry)

As the line of $B$ $131°, 52'$ — 9.87199
is to AC $120°$ — 2.07918
so is the line of A $55°, 45'$ — 9.74474
to the true distance CB $89°, 53'$ — 1.95194

Example III. Suppose a ship coming out from sea in the night, has sight of Scilly light, bearing NESW $12°$ 4 leagues, it being then flood tide setting ENE 2 miles an hour, and the ship running after the rate of 5 miles an hour. Required upon what course and how far the ship has sailed, it will he

DAC equal to 67° 30' Whence for AC, the distance run

As radius 10.00000
is to the differ. of latitude AD 8 — 0.90309
so is the current's drift LC 2 — 0.69897
to the angle LDC, the course the ship must steer is S 88° 03' E.

Then for the distance AB, it will be (by oblique trigonometry)

As the line of B $155°, 33'$ — 9.61689
is to AL 57.45 — 1.76080
so is the line of L $17°, 32'$ — 9.47894
to AB 41.06 — 1.62283
consequently, since the ship is sailing at the rate of 5 miles an hour, it follows, that in sailing 8th 24th of $88°, 03'$ E, she will arrive at the Lizard.

Example IV. A ship from a certain headland in the latitude of $34°$ 00' north, fails SEWS 12 miles in three hours, in a current that sets between north and east; and then the same headland is found to bear WNW, and the ship to be in the latitude of $33°, 52'$ north. Required the setting and drift of the current.

Geometrically. Having drawn the compas NESW (No. 29.) let A represent the place of the ship, and draw the SWS line AB equal to 12 miles, also the ESS line AC.

Set off from A upon the meridian AD, equal to 8 miles, the difference of latitude, and through D draw DC parallel to the east and west line WE, meeting AC in C. Join C and B with the right line BC; then C will be the ship's place, the angle ABC the setting of the current from the SWS line, and the line BC will be the drift of the current in 3 hours. To find which

By Calculation:

In the triangle ADC right angled at D, are given the difference of latitude AD equal to 8 miles, the angle DAC equal to $67°, 30'$ Whence for AC, the distance the ship has failed, it will be

As radius $10.00000$
is to the differ. of latitude AD 8 — 0.90309
so is the current's drift D

DAC $67°, 30'$ 10.41716
to the distance run AC 20.9 — 1.32025
Again, in the triangle ABC, are given AB equal to $5°$ E
N A V I G A T I O N.

12 miles, AC equal to 20.9, and the angle BAC equal to 33° 45', the distance between the SE&S and ESE lines. Whence for the angle at B, it will be,

As the sum of the sides AC and AB 32.9 1.51720
is to their difference — 8.9 — 0.94930
so is the tang. of half the sum of the angles C and B 73° 07' — 10.51806
tang. of ½ their diff. 41°, 43' ¼ — 9.95095
consequently the angle B is 114° 51', and to the setting of the current will be N 81° 06' E or ESE 2° 21' E.

Then for BC the current's drift in 3 hours, it will be,

0° 21' E — 4.266 miles an hour.

The fine of B — 114°, 51' — 9.92700
is to radius 10.00000
the current's drift in 3 hours, and consequently the current is to compass EBN 2° 21' E 4.266 miles an hour.

Sect. 8. Concerning the Variation of the Compass, and how to find it from the true and observed Amplitudes or azimuths of the sun.

1. The variation of the compass is how far the north or south point of the needle stands from the true north or south point of the horizon towards the east or west; or it is an arch of the horizon intercepted between the meridian of the place of observation and the magnetic meridian.

2. It is absolutely necessary to know the variation of the compass at sea, in order to correct the ship's course; for since the ship's course is directed by the compass, it is evident that if the compass be wrong the true course will differ from the observed, and consequently the whole reckoning differ from the truth.

3. The sun's true amplitude is an arch of the horizon comprehended between the true east or west point thereof, and the centre of the sun at rising or setting; or it is the number of degrees, &c. that the centre of the sun is distant from the true east or west point of the horizon, towards the south or north.

4. The sun's magnetic amplitude is the number of degrees that the centre of the sun is from the east or west point of the compass, towards the south or north point of the same at rising or setting.

5. Having the declination of the sun, together with the latitude of the place of observation, we may from thence find the sun's true amplitude, by the following astronomical proposition, viz.

As the co-flne of the latitude is to the radius.
so is the fine of the sun's declination to the fine of the sun's true amplitude which will be north or south according as the sun's declination is north or south.

Example. Required the sun's true amplitude in the latitude of 41° 50' north, the 23d day of April 1731.

First, I find (from the tables of the sun's declination) that the sun's declination the 23d of April is 15° 54' north; then for the true amplitude, it will be, by the former analogy.

As the co-flne of the lat. 41° 50' — 9.87221
is to radius 10.00000
so is the fine of the decl. 15° 54' — 9.43769
to the fine of the amplitude. 21°, 35' — 9.56548
which is north, because the declination is north at that time; and consequently, in the latitude of 41° 50' north, the sun rises on the 23d of April 21° 35' from the east part of the horizon towards the north, and sets so much from the west the same way.

6. The sun's true azimuth is the arch of the horizon intercepted between the meridian and the vertical circle passing through the centre of the sun at the time of observation.

7. The sun's magnetic azimuth is the arch of the horizon intercepted between the magnetic meridian and the vertical, passing through the sun.

8. Having the latitude of the place of observation, together with the sun's declination and altitude at the time of observation, we may find his true azimuth after the following method, viz.

Make it,

As the tangent of half the complement of the latitude is to the tangent of half the sum of the distance of the sun from the pole and complement of the altitude.

So is the tangent of half the difference between the distance of the sun from the pole and complement of the altitude.

To the tangent of a fourth arch which fourth arch added to half the complement of the latitude will give a fifth arch, and this fifth arch lessened by the complement of the latitude will give a sixth arch.

Then make it,

As the radius is to the tangent of the altitude.
so is the tangent of the sixth arch to the co-flne of the sun's azimuth.

which is to be counted from the south or north, to the east or west, according as the sun is situated with respect to the place of observation.

If the latitude of the place and declination of the sun be both north or both south, then the declination taken from 90° will give the sun's distance from the pole; but if the latitude and declination be on contrary sides of the equator, then the declination added to 90° will give the sun's distance from the nearest pole to the place of observation.

Example. In the latitude of 51° 32' north, the sun having 19° 39' north declination, his altitude was found by observation to be 38° 18'. Required the azimuth.

By the first of the foregoing analogies, it will be

As the tangent of ½ the complement of the altitude 61° 01' 10.25655
is to the tangent of ½ the sum of the distance of the sun from the pole and complement of the altitude

so is the tangent of half their difference 9° 19° 7.21499

to the tang. of a 4th arch 40° 20° 9.92885
which fourth arch 40° 20° added to 19° 14° half the complement of the latitude, give a fifth arch 59° 34'; and this fifth arch lessened by 38° 28°, the complement of the latitude, gives the sixth arch 21° 06'; then for the
the azimuth, it will be, by the second of the preceding analogies,

As radius ——— 10,00000

is the tangent of the altitude 38°, 18' 9.89949

so is the tangent of the sixth arch 21°, 06' 9.58644

to the co-sine of the azimuth 72°, 15' 9.48393

which, because the latitude is north and the sun fouth of
the place of observation, must be counted from the south
towards the east or west; and consequently, if the alti-
tude of the sun was taken in the morning, the azimuth
will be S 72° 15' E, or ESE 4° 45' E; but if the alti-
tude was taken in the afternoon, the azimuth will be
S 72° 15' W, or WSW 4° 45' westerly.

9. Having found the sun's true azimuth or azimuth
by the preceding analogies, and his magnetic azimuth
or azimuth by observation, it is evident, if they agree,
there is no variation; but if they disagree, then if the
true and observed azimuths at the rising or setting of
the sun be both of the same name, i.e. either both
north, or both south, their difference is the variation;
but if they be of different names, i.e. one north and
the other south, their sum is the variation. Again, if
the true and observed azimuth be both of the same name,
i.e. either both east or both west, their difference is the
variation: but if they be of different names, their sum is
the variation. And to know whether the variation is
easterly, observe this general rule, viz.

Let the observer's face be turned to the sun: then if
the true azimuth or azimuth be to the right hand of
the observed, the variation is easterly; but if it be to the
left, westerly.

To explain which, let NESW (No. 30.) represent a
compass, and suppose the sun is really ESE at the time
of observation, but the observer sees him off the east
point of the compass, and so the true azimuth or azi-
muth of the sun is to the right of the magnetic or ob-
erved; here it is evident that the ESE point of the
compass ought to lie where the east point is, and so the
north where the NW is; consequently the north point
of the compass is a point too far east, i.e. the variation
in this case is easterly. The same will hold when the azi-
muth or azimuth is taken on the west side of the mer-
idian.

Again, let the true azimuth or azimuth be to the
left hand of the observed. Thus, suppose the sun is really
EWN at the time of observation, but the observer sees
him off the west point of the compass, and so the true
azimuth or azimuth to the left of the observed: Here
it is evident that the EWN point of the compass ought
not to stand where the east point is, and so the north
where the N6E point is; consequently the north point
of the compass lies a point too far west, i.e. the varia-
tion is westerly. The same will hold when the azi-
muth is observed on the west side of the meridian.

Example I. Suppose the sun's true azimuth at ri-

ing was found to be E 14° 20' N, but by the compass it

is found to be E 26° 12': Required the variation, and

which way it is.

Since they are both the same way, therefore

From the magnetic azimuth ——— E 26°, 12' N.

take the true azimuth ——— E 14°, 20' N.

and there remains the variation ——— 11°, 52 E.

which is easterly, because in this case the true azimuth
is the right of the observed.

Example II. Suppose the sun's true azimuth at set-
ing is W 34° 26' S, and his magnetic azimuth W 23°
13' S: Required the variation, and which way it is.

Since they lie both the same way, therefore

From the sun's true azimuth ——— W 34°, 26' S.

take his magnetic azimuth ——— W 23°, 13' S.

there remains the variation ——— 11°, 13 W.

which is westerly, because the true azimuth is, in this
case, to the left hand of the observed.

Example III. Suppose the sun's true azimuth at rising
is found to be 13° 7° 4' N, and his magnetic E 12° 32' S:

Required the variation, and which way it lies.

Since the true and observed azimuths lie different
ways, therefore

To the true azimuth ——— E 13°, 24' N.

add the magnetic azimuth ——— E 12°, 32' S.

the sun is the variation ——— 25°, 56 W.

which is westerly, because the true azimuth is, in this
case, to the left of the observed.

Example IV. Suppose the sun's true azimuth at set-
ing is found to be W 8° 24' N, but his magnetic azi-
muth is W 10° 13' S: Required the variation.

To the true azimuth ——— W 8°, 24' N.

add the magnetic ——— W 10°, 13' S.

the sun is the variation ——— 18°, 37 E.

which is easterly, because the true azimuth is to the
right of the observed.

Example V. Suppose the sun's true azimuth at the
time of observation, is found to be N 86° 40' E, but by
the compass it is N 73° 24' E: Required the variation,
and which way it lies.

From the true azimuth, ——— N 86°, 40' E.

take the magnetic, ——— N 73°, 24' E.

there remains the variation, ——— 13°, 16 E.

which is westerly, because the true azimuth is to the
right of the observed.

Example VI. Suppose the sun's true azimuth is S
3° 24' E and the magnetic S 4° 36' W: Required
the variation, and which way it lies.

To the true azimuth ——— S 3°, 24' E.

add the magnetic azimuth ——— S 4°, 36' W.

the sun is the variation ——— 8°, 00 W.

which is westerly, because the true azimuth is to the
left of the observed.

10. The variation of the compass was first observed
at London, in the year 1580, to be 11° 15' easterly, and
in the year 1622 it was 6° 05' E; also in the year
1634, it was 4° 05' E, still decreasing, and the needle
approaching the true meridian, till it coincided with it,
and then there was no variation; after which, the varia-
tion.
tion began to be westerly; and in the year 1672, it was 2° 30' W; also in the year 1683, it was 4° 30' W; and since that time the variation still continues at London to increase westerly; but how far it will go that way, time and observations will probably be the only means to discover.

Again, at Paris, in the year 1640, the variation was 3° 00' E; and in the year 1666, there was no variation; but in the year 1681, it was 2° 30' W, and still continues to go westerly.

In short, from observations made in different parts of the world, it appears, that in different places the variation differs both as to its quantity and denomination, it being east in one place, and west in another; the true cause and theory of which, for want of a sufficient number of observations, has not as yet been fully explained.

Sec. 9. The Method of keeping a Journal at sea; and how to correct it, by making proper allowances for the leeway, variation, &c.

1. Lee-way is the angle that the rhomb line, upon which the ship endeavours to fail, makes with the rhomb she really fails upon. This is occasioned by the force of the wind or surge of the sea, when she lies to the windward, or is close hauled, which causes her to fall off and glide sideways from the point of the compass the capes at. Thus let NESW (No. 31.) represent the compass; and suppose a ship at C capes at, or endeavours to fail upon, the rhomb Ca; but by the force of the wind, and surge of the sea, she is obliged to fall off, and make her way upon the rhomb Cb; the angle aCb is the leeway; and if that angle be equal to one point, the ship is said to make one point leeway; and if equal to two points, the ship is said to make two points leeway, &c.

2. The quantity of this angle is very uncertain, because some ships, with the same quantity of fail, and with the same gale, will make more leeway than others; it depending much upon the mould and trim of the ship, and the quantity of water that she draws. The common allowances that are generally made for the leeway, are as follow.

4. If one top fail must be handed, then the ship is supposed to make between two and three points leeway.

5. When both top-fails must be handed, then the allowance is about four points for leeway.

6. If it blow so hard, as to occasion the fore-course to be handed, the allowance is between 5½ and 6 points.

7. When both main and fore-courses must be handed, then 6 or 6½ points are commonly allowed for leeway.

8. When the mizen is handed, and the ship is trying a hull, she is then commonly allowed about 7 points for leeway.

3. Though these rules are such as are generally made

4. Having the course steered, and the leeway, given; we may from thence find the true course by the following method, viz. Let your face be turned directly to the windward; and if the ship have her larboard tacks on board, count the leeway from the course steered towards the right hand; but if the starboard tacks be on board, then count it from the course steered towards the left hand. Thus, suppose the wind is at NNW, and the ship lies up within 6 points of the wind, with her larboard tacks on board, making one point leeway; here it is plain, that the course steered is ENE, and the true course EWN; also suppose the wind is at NNW, and the ship lies up within 6½ points of the wind, with her starboard tack on board, making 1½ point leeway; it is evident that the true course, in this case, is WSW.

5. We have shewed, in the last section, how to find the variation of the compass; and from what has been said there, we have this general rule for finding the ship's true course, having the course steered and the variation given, viz. Let your face be turned towards the point of the compass upon which the ship is steered; and if the variation be westerly, count the quantity of it from the course steered towards the right hand; but if easterly, towards the left hand; and the course thus found is the true course steered. Thus, suppose the course steered is NNE, and the variation one point easterly; then the true course steered will be NNW: Also suppose the course steered is NESE, and the variation one point westerly; then in this case, the true course will be NE; and so of others.

Hence, by knowing the leeway variation, and course steered, we may from thence find the ship's true course; but if there be a current under foot, then that must be tried, and proper allowances made for it, as has been shown in the section concerning Currents, from thence to find the true course.

6. After making all the proper allowances for finding the ship's true course, and making as just an estimate of the distance as we can; yet by reason of the many accidents that attend a ship in a day's running, such as different rates of falling between the times or hearing the log,
the want of due care at the helm by not keeping her steady, but suffering her to yaw and fall off; sudden storms, when no account can be kept, &c.; the latitude by account frequently differs from the latitude by observation; and when that happens, it is evident there must be some error in the reckoning; to discover which, and where it lies, and also how to correct the reckoning, you may observe the following rules.

If the ship fail near the meridian, or within 2 or 3 points thereof; then if the latitude by account disagrees with the latitude by observation, it is most likely that the error lies in the distance run; for it is plain that in this case it will require a very sensible error in the course to make any considerable error in the difference of latitude, which cannot well happen if due care be taken at the helm, and proper allowances be made for the lee-way, variation, and currents. Consequently if the course be pretty near the truth, and the error in the distance run regularly through the whole, we may, from the latitude obtained by observation, correct the distance and departure by account, by the following analogies, viz. As the difference of latitude by account is to the true difference of latitude, so is the departure by account to the true departure, and so is the direct distance by account to the true direct distance.

The reason of this is plain: for let AB (No. 33) denote the meridian of the ship at A, and suppose the ship fails upon the rhomb AE near the meridian, till by account she is found in C, and consequently her difference of latitude by account is AB; but by observation she is found in the parallel ED, and so her true difference of latitude is AD, her true distance AE, and her true departure DE; then since the triangles ABC ADE are similar, it will be AB : AD :: BC : DE, and AB : AD :: AC : AE.

Example. Suppose a ship from the latitude of 43° 50' north, after having failed upon several courses near the parallel of east and west, for the space of 24 hours, is found by dead reckoning to be in the latitude of 42° 45' north, and to have made 160 miles of westing; but by a good observation the ship is found to be in the latitude of 42° 35' north: Required the true course, and direct distance failed.

With the true difference of latitude 75 miles, and departure 160 miles, we shall find (by Case 4. of Plain Sailing) the true course to be S 64° 55' W, and the direct distance 176.7 miles.

3dly, If the courses are for the most part near the middle of the quadrant, and the direct course within 2 and 6 points of the meridian; then the error may be either in the course, or in the distance, or in both, which will cause an error both in the difference of latitude and departure; to correct which, having found the true difference of latitude by observation, with this, and the direct distance by dead reckoning, find a new departure (by Case 3. of Plain Sailing:) then half the sum of this departure, and that by dead reckoning, will nearly be equal to the true departure; and consequently with this, and the true difference of latitude, we may (by Case 4. of Plain Sailing) find the true course and distance.

Example. Suppose a ship from the latitude of 44° 38' north, falls between fourth and east upon several courses, near the middle of the quadrant, for the space of 24 hours, and is then found by dead reckoning to be in the latitude of 42° 15' north, and to have made of westing 136 miles; but by observation she is found to be in the latitude of 42° 09' north: Required her true course and distance.

With the true difference of latitude 154 miles, and the direct distance by dead reckoning 197.4, you will find (by Case 3. of Plain Sailing) the new departure to be 123.4, and half the sum of this and the departure by dead reckoning will be 123.7 the true departure; then with this, and the true difference of latitude, you will find (by Case 4. of Plain Sailing) the true course to be S 39° 04' E, and the direct distance 198.2 miles.

7. In keeping a ship's reckoning at sea, the common method is to take from the log-book the several courses and distances steered by the ship left 24 hours, and to transfer these together with the most remarkable occurrences into the log-book, into which also are inserted the courses corrected, and the difference of latitude and difference of longitude made good upon each; then the whole day's work being finished in the log-book, if the latitude by account agree with the latitude by observation, the ship's place will be truly determined; but if not, then the reckoning must be corrected according to the preceding rules, and placed in the journal.

The form of the Log-book and Journal, together with an example of 2 days work, you have here subjoined.

Note. To express the days of the week, they commonly use the characters by which the sun and planets are expressed, viz. O denotes Sunday, & Monday, & Tuesday, & Wednesday, & Thursday, & Friday, and & denotes Saturday.
NAVIGATION.

The FORM of the

LOG-BOOK,

With the Manner of working Days Works at Sea.

**The Log-Book.**

<table>
<thead>
<tr>
<th>H.K.</th>
<th>K. Courses</th>
<th>Winds</th>
<th>Observations and Accidents.</th>
<th>Day of</th>
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<tbody>
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<td>SW W</td>
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<td>12 8</td>
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**The Log-Book.**

<table>
<thead>
<tr>
<th>Courses Correct</th>
<th>Diff.</th>
<th>Diff. Lat.</th>
<th>Diff. long.</th>
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<tr>
<td>S SW</td>
<td>50</td>
<td>46.2</td>
<td>29.4</td>
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<tr>
<td>S N W</td>
<td>19</td>
<td>18.6</td>
<td>5.5</td>
</tr>
<tr>
<td>S W</td>
<td>49</td>
<td>29.7</td>
<td>45.5</td>
</tr>
<tr>
<td>S W S</td>
<td>24.5</td>
<td>20.2</td>
<td>20.0</td>
</tr>
<tr>
<td>S W E</td>
<td>25.5</td>
<td>19.5</td>
<td>24.6</td>
</tr>
</tbody>
</table>

Hence the ship, by account, has come to the latitude of 47° 46' north, and has differed her longitude 2° 5' westerly; so this day I have made my way good S 31° 31' W, distance 157.4 miles.

At noon the Lizard bore from me N 31° 31' E, distance 157.4 miles; and having observed the latitude, I found it agreed with the latitude by account.
The Log Book.

<table>
<thead>
<tr>
<th>Day of</th>
<th>Winds observed</th>
<th>Accidents</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 2</td>
<td>SSW W</td>
<td>This 24 hours, and fore course, and variable.</td>
</tr>
<tr>
<td>2 1</td>
<td>Handed the main strong gale of wind and lee-way 6 points.</td>
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<td>4 1</td>
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<td>5 1</td>
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<td>7 1</td>
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<tr>
<td>8 1</td>
<td>The wind increasing, we tried a hull, lee-way 7 points.</td>
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<tr>
<td>9 1</td>
<td>The variation I judge to be 1 point west.</td>
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<tr>
<td>10 1</td>
<td></td>
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<tr>
<td>11 1</td>
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<tr>
<td>12 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 2</td>
<td>SWbW NWbW</td>
<td>Set main-fail, lee-way 4 1/2 points.</td>
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<tr>
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<td>7 1</td>
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<tr>
<td>8 4</td>
<td>S&amp;E SWbW</td>
<td>Set fore-fail, lee-way 3 points.</td>
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<tr>
<td>9 4</td>
<td></td>
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<td>10 4</td>
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<td>11 5</td>
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<tr>
<td>12 4</td>
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</tbody>
</table>

Lat. by observation, 47° 06' N.

NAUMACHIA,

<table>
<thead>
<tr>
<th>Week Days</th>
<th>Month Days</th>
<th>Winds</th>
<th>Direct Course</th>
<th>Diff. Miles</th>
<th>Latitude Correct</th>
<th>Whole Diff. Long. made</th>
<th>Bearing and Diff.</th>
<th>Remarkable Observations and Accidents</th>
</tr>
</thead>
<tbody>
<tr>
<td>D</td>
<td></td>
<td>N E E</td>
<td>S 31, 31 W</td>
<td>157.4</td>
<td>47°, 46’</td>
<td>2°, 5’ W</td>
<td>At noon the Lizard bore N.</td>
<td>Fair weather at four compass, S.</td>
</tr>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>P. M. I took my departure from the Lizard.</td>
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<td>31° 31’ E. Diff. 157.4 miles.</td>
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<td></td>
<td></td>
<td></td>
<td>At noon the Lizard bore S.</td>
<td>Strong gales of wind and variable.</td>
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<td></td>
<td>17° 55’ W. Diff. 183 miles.</td>
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</tbody>
</table>

A Journal from the Lizard towards Jamaica in the ship Neptune, J. M. commander.
NAUMACHIA, in antiquity, a show or spectacle among the ancient Romans, representing a sea-fight.

NAUMBURG, a city of Germany, the capital of the county of Sax Naumburg, in Upper Saxony, situated in E. long. 12°, N. lat. 51° 15'.

NAUSEA, in medicine, a reaching, or propensity and endeavour to vomit, arising from a loathing of food, excited by some viscid humour that irritates the stomach.

NAUTICAL PLANISPHERE, a description of the terrestrial globe upon a plane for the use of mariners, more usually called chart.

NAUTILUS, in zoology, a genus belonging to the order of vermes testacea. The shell consists of one spiral valve, divided into several apartments by partitions. There are 17 species, principally distinguished by peculiarities in their shells.

NAVY, the fleet or shipping of a prince or state. The management of the British navy-royal, under the lord high admiral of Great Britain, is entrusted to principal officers and commissioners of the navy, who hold their places by patent. The principal officers of the navy are four, viz. the treasurer, whose business it is to receive money out of the exchequer, and to pay all the charges of the navy, by warrant from the principal officers: comptroller, who attends and comp-}

The commission of the navy are five: the first executes that part of the comptroller's duty which relates to the comptrolling the victuallers accounts; the second, another part of the said comptroller's duty, relating to the account of the store-keepers of the yard; the third has the direction of the navy at the port of Portsmouth; the fourth has the same at Chatham; and the fifth, at Plymouth.

There are also other commissioners at large, the number more or less according to the exigencies of public affairs; and since the increase of the royal navy, these have several clerks under them, with salaries allowed by the king.

The victualling of the royal navy hath formerly been undertaken by contract; but is now managed by commissioners, who hold their office on Tower-hill, London.

The navy-office is where the whole business concerning the navy is managed by the principal officers and commissioners.

The royal navy of Great Britain is now in a very flourishing state; having been diligently kept up in late reigns, as the natural strength of the kingdom. When it is complete, it is divided into three squadrons, distinguished by the different colours of the flags carried by the respective admirals belonging to the same.

NAXIA, one of the islands of the Archipelago, about an hundred miles in circumference, situated in E. long. 26°, and N. lat. 36° 30'.

NAZARENES, in church history, a name originally given to all Christians in general, on account that Jesus Christ was of the city of Nazareth; but afterwards restrained to a sect of heretics, whose religion consisted of a strange jumble of Judaism and Christianity; observing at the same time the Mosaic law and the several rites of the Christian religion.

NAZARITES, among the Jews, persons who either of themselves, or by their parents, were dedicated to the observance of nazarite ship. They were of two sorts: namely, such as were bound to this observance for only a short time, as a week or month; or those who were bound to it all their lives. All that we find peculiar in the latter's way of life, is, that they were to abstain from wine and all intoxicating liquors, and never to shave or cut off the hairs of their heads. The first sort of Nazarites were moreover to avoid all defilement; and if they chanced to contract any pollution before the term was expired, they were obliged to begin afresh. Women as well as men might bind themselves to this vow.

NEALED, among seamen, is used when the sounding is deep water close to the shore; as also when the shore is sandy, clayey, oozy, or foul and rocky ground.

NEAPED. When a ship wants water so that she cannot get out of the harbour, off the ground, or out of the dock, the seamen say the ship is neaped, or be-neaped.

NEATH, a town of Glamorganshire, in south Wales, situated on the river Neath, near the Bristol channel, twenty-eight miles north west of Landaff.

NEBULY, or Nebulee, in heraldry, is when a coat is charged with several little figures, in form of words, running within one another, or when the outline of a bordure, ordinary, &c. is indented or waved, as represented in Plate CXXXIV. fig. 3.

NECESSARY, in a philosophical sense, that which cannot but be, or cannot be otherwise.

NECESSITY, whatever is done by a necessary cause, or a power that is irresistible, in which sense it stands opposed to freedom. See METAPHYSICS.

NECK, in anatomy, is that slender part situated between the head and trunk of the body. See ANATOMY.

NECKAR, a river of Germany, which rises in the south part of the circle of Swabia, and falls into the Rhine at Manheim.

NECROMANCY, a species of divination, performed by raising the dead, and extorting answers from them. See DIVINATION.

NECTAR, among ancient poets, the drink of the fabulous deities of the heathens, in contradistinction from their solid food, which was called ambrosia.

NECTARINE. See PERSIC.

NECTARINE. See PERSIC.

NECTARIUM, among botanists. See BOTANY, p. 627.

NECYDALIS, in zoology, a genus of insects belonging to the order of coleoptera. The feelers are fetaeous; the elytra are shorter and narrower than the wings; and the
the tail is simple. There are eleven species, chiefly distinguided by the size and figure of the elytra.

NEEDHAM, a market-town of Suffolk, situated on the river Orwell, eight miles north-west of Ipswich.

NEEDLE, a very common little instrument or utensil, made of steel, pointed at one end, and pierced at the other, used in sewing embroidery, tapestry, &c.

Needles make a very considerable article in commerce, though there is scarce any commodity cheaper, the consumption of them being almost incredible. The sizes are from no. 1, the largest, to no. 25 the smallest. In the manufacture of needles, German and Hungarian steel are of most repute.

In the making of them, the first thing is to pass the steel through a coal fire, and under a hammer, to bring it out of its square figure into a cylindrical one. This done, it is drawn through a large hole of a wire-drawing iron, and returned into the fire, and drawn through a second hole of the iron, smaller than the first, and thus successively from hole to hole, till it has acquired the degree of fineness required for that species of needles, observing every time it is to be drawn, that it be greased over with lard, to render it more manageable. The steel thus reduced to a fine wire, is cut in pieces of the length of the needles intended. These pieces are flatted at one end on the anvil, in order to form the head and eye; they are then put into the fire, to soften them farther; and thence taken out and pierced at each extreme of the flat part on the anvil, by force of a punchon of well tempered steel, and laid on a leaden block to bring out, with another punchon, the little piece of steel remaining in the eye. The corners are then filed off the square of the heads, and a little cavity filed on each side of the flat of the head; this done, the point is formed with a file, and the whole filed over; they are then laid to heat red hot on a long flat narrow iron, crooked at one end, in a charcoal fire, and when taken out thence are thrown into a bason of cold water to harden. On this operation a good deal depends; too much heat burns them, and too little leaves them soft; great care here too must be taken of the degree of heat. They are then straightened one after another with the hammer, the coldness of the water used in hardening them having twitted the greatest part of them.

The next proceeds is the polishing them. To do this, they take twelve or fifteen thousand needles, and range them in little heaps against each other on a piece of new buckram sprinkled with emery-dust. The needles thus disposed, emery dust is thrown over them, which is again sprinkled with oil of olives; at last the whole is made up into a roll, well bound at both ends. This roll is then laid on a polishing table, and over it a thick plank laden with flones, which two men work backwards and forwards a day and a half or two days successively, by which means the roll thus continually agitated by the weight and motion of the plank turns itself to certain points in or under the horizon. See Navigation.

Needle fish. See Syngnathus.

Needles, two capes, or head-lands, at the west end of the isle of Wight, which is very difficult to pass on account of the sands and rocks.

NEFASTI dies, in Roman antiquity, an appellation given to such days wherein it was not allowed to administer justice, usually marked in the calendar by N. or N. P. i.e. nefastus prima, when only nefastus for the first part of it.

NEGAPATAN, a port-town of the hither India, situated on the coast of Coromandel: E. long. 79°, N. lat. 11° 15'.

NEGATION, in logic, an act of the mind affirming one thing to be different from another; as, that the soul is not matter.

Negative, in general, something that implies a negation: thus we say, negative quantities, negative signs, negative powers, &c. See Metaphysics and Logic.

NEGOMBO, a port-town on the west coast of the isle of Ceylon, in the Indian ocean, subject to the Dutch: E. long. 78°, N. lat. 7° 41'.

NEGRAIS, a port-town of Pegu, in the further India, situated on the west side of the bay of Bengal: E. lon. 92° 30', N. lat. 17°.

NEGRI Point, the most westerly promontory of the island of Jamaica.

NEGROES, properly the inhabitants of Nigritia in Africa, also called blacks and moors; but this name is now given to all the blacks.

The origin of the negroes, and the cause of this remarkable difference from the rest of the human species, has much perplexed the naturalists. Mr. Boyle has observed, that it cannot be produced by the heat of the climate: for though the heat of the sun may darken the colour of the skin, yet experience does not shew that it is sufficient to produce a new blackness, like that of the negroes.

In Africa itself, many nations of Ethiopia are not black, nor were there any blacks originally in the West Indies. In many parts of Asia, under the same parallel with the African region, inhabited by blacks,
the people are but tawny. He adds, that there are negroes in Africa, beyond the southern tropics; and a river sometimes parts nations, one of which is black and the other only tawny. Dr Barriere alludes that the gall of negroes is black, and being mixed with their blood is deposited between their skin and scar-flesh. However, Dr Mitchel of Virginia, in the philosophical transactions, 0° 47′, has endeavoured by many learned arguments to prove, that the influence of the sun in hot countries, and the manner of life of their inhabitants, are the remote causes of the colour of negroes, Indians, &c. and indeed it would be a strong confirmation of his doctrine, if we would see any people, originally white, become black and woolly by transplantation, or vice versa.

Negroes are brought from Guinea, and other coasts of Africa, and sent into the colonies in America, to cultivate tobacco, sugar, indigo, &c. and in Mexico and Peru, to dig in the mines; and this commerce, which is scarce defensible on the foot either of religion or humanity, is now carried on by all the nations that have settlements in the West Indies. These negroes make the best slaves who are brought from Angola, Senegal, Cape Verd, the river Gambia, the kingdoms of Jolofes, Daniel, Galland, &c.

There are various ways of procuring them: some, to avoid famine, fell themselves, their wives and children, to their princes, or other great men; others are made prisoners of war; and great numbers are seized in excursions made for that very purpose by the petty princes upon one another's territories, in which it is usual to sweep away all without distinction of age or sex.

Negroes-island, one of the Philippine islands, in the Indian ocean, subject to Spain; so called, because most of the inhabitants are blacks: E. long. 120°, N. lat. 10′.

Negroland, or Negritia, a country of Africa, which lies between 18° west and 15° east longitude, and between 10° and 20° of north latitude, the great river Niger running through it. It is bounded by Zaara, or the desert, on the north, by unknown countries on the east, by Guinea on the south, and by the Atlantic ocean on the west.

Negropont, or Ecripos, the capital of the island of Negropont, anciently called Euboza, situated in the Archipelago, on the west side of the island; where the strait is so narrow, that it is joined to the continent by a bridge: E. lon. 24° 30′, N. lat. 38° 30′.

Nehemiah, a canonical book of the Old Testament so called from the name of its author. Nehemiah was born in Babylon, during the captivity, and succeeded Ezra in the government of Judah and Jerusalem. He was a Jew, and was promoted to the office of cup-bearer to Artaxerxes Longimanus, king of Persia; when the opportunity he had of being daily in the king's presence, together with the favour of Esther the queen, procured him the favour of being authorized to repair and fortify the city of Jerusalem, in the same manner as it was before its destruction by the Babylonians. On his going to Jerusalem, he assisted the rebuilding of the walls in fifty-two days, and dedicated the gates of the city with great solemnity. He then reformed some abuses which had crept among his countrymen, particularly the extortion of the usurers, by which the poor were so oppressed as to be forced to sell their lands and children for support: after which he returned to Persia, and came back again with a new commission, by virtue of which he regulated every thing relating both to the state and religion of the Jews. The history of these transactions is the subject of this book.

Nellenburg, a city of Swabia, in Germany, capital of a county of the same name, situated fifteen miles north of Conflance.

Nemæa, a town in the Morea, thirty miles south of Corinth, where the ancient Nemæan games were celebrated.

Nemæan Games, were so called from Nemæa, a village between the cities of Cleone and Philus, where they were celebrated every third year. The exercices were chariot races, and all the parts of the pentathlon. These games were instituted in memory of Opheletes, or Archemorus, the son of Euphextes and Creusa, and nursed by Hyperipyle; who, leaving him in a meadow, while she went to shew the besiegers of Thebes a fountain, at her return found him dead, and a serpent twisted about his neck; whence the fountain, before called Lantè, was named Archemorus; and the captains, to comfort Hypeipyle, instituted these games. Others ascribe their institution to Hercules, after his victory over the Nemæan lion.

Nemours, a town in the Isle of France, forty-two miles south of Paris: E. long 2° 45′, N. lat. 48° 17′.

Neomedia, or Noumenia, a festival of the ancient Greeks, at the beginning of every lunar month, which was, as the name imports, observed upon the day of the new moon, in honour of all the gods, but especially Apollo, who was called Neoménios; because the sun is the fountain of light, and whatever distinction of times and feasons may be taken from other planets, yet they are all owing to him as the original of those borrowed rays by which they shine.

Nephytes, new plants, a name given by the ancient Christians to those heathens who had newly embraced the faith; such persons being considered as regenerated, or born anew by baptism. The term neephytes has been also used for new priests, or those just admitted into orders, and sometimes for the novices in monasteries. It is still applied to the converts made by the missionaries among the infidels.

Neottia, in botany. See Ophrys.

Nepa, in zoology, a genus of insects belonging to the order of hemiptera. The rostrum is inflected; the antennae are shorter than the thorax; and the hind-feet are hairy, and fitted for swimming. There are seven species.

Nepenthès, in botany, a plant of the gynandra tetrandra clas. The calyx consists of four segments; it has no corolla; and the capsule has four cells. *There is but one species, a native of Ceylon.

Nepers' Rods, or bones, an instrument invented by
Fig. 1. Nepers Rods

Plate CXXXIV

Fig. 2. Nocturnal

Fig. 3. Nebuly

Fig. 4. Olive Press

5 Or. 6 Orle. 7 Pale 8 Palisse 9 Pall 10 Paly

11 Party per Pale. 12 Passion Cross

13 Patee. 14 Patriarchal Cross

15 Perambulator
by J. Neper, baron of Merchiston, in Scotland, where-
by the multiplication and division of large numbers are
much facilitated.

As to the construction of Neper's rods: suppose the
tomnial table of multiplication to be made upon a
plate of metal, ivory, or paste-board, and then con-
cieve the several columns (standing downwards from
the digits on the head) to be cut asunder; and these
are what we call Neper's rods for multiplication. But
then there must be a good number of each; for as
many times as any figure is in the multiplicand, so
many rods of that species (i.e., with that figure on the
top of it) must we have; though six rods of each spe-
cies will be sufficient for any example in common af-
fairs: there must also be as many rods of o's.

But before we explain the way of using these rods,
there is another thing to be known, viz. that the fi-

tures on every rod are written in an order different
from that in the table. Thus, the little square space
or division in which the several products of every co-
cumn are written, is divided into two parts by a line
across from the upper angle on the right to the lower
on the left; and if the product is a digit, it is set in
the lower division; if it has two places, the first is
set in the lower, and the second in the upper division;
but the spaces on the top are not divided; also there
is a rod of digits, not divided, which is called the in-
dex rod, and of this we need but one single rod. See
the figure of all the different rods, and the index, fi-
parate from one another, in Plate CXXXIV. fig. 1.

Multiplication by Neper's rods. First lay down the in-
dex rod; then on the right of it set a rod whose top is
the figure in the highest place of the multiplicand;
next to this again, set the rod whose top is the next
figure of the multiplicand; and so on in order, to the
first figure. Then is your multiplicand tabulated for
all the nine digits; for in the fame line of squares
standing against every figure of the index rod, you
have the product of that figure, and therefore you
have no more to do but to transfer the products and
sum them. But in taking out these products from the
rods, the order in which the figures stand obliges you
to a very easy and small addition; thus, begin to take
out the figure in the lower part, or unit's place, of
the square of the first rod on the right; add the fi-
ture in the upper part of this rod to that in the lower
part of the next, and so on, which may be done as
faf as you can look on them. To make this practice
as clear as possible, take the following example.

Example: To multiply 4768 by 185. Having set
the rods together for the number 4768 (ibid n° 2.)
against 5 in the index, I find this number, by adding
according to the rule,

\[23840\]
\[38144\]
\[14304\]

Total product \[1835680\]

To make the use of the rods yet more regular and
easy, they are kept in a flat square box, whose breadth
is that of ten rods, and the length that of one rod, as
thick as to hold six (or as many as you please) the
capacity of the box being divided into ten cells for
the different species of rods. When the rods are put
up in the box (each species in its own cell distinguish
by the first figure of the rod set before it on the face
of the box near the top) as much of every rod (ends
without the box as shews the first figure of that rod;
also upon one of the flat sides without and near the
edge) upon the left hand, the index rod is fixed; and
along the foot there is a small ledge, so that the rods
when applied are laid upon this side, and supported
by the ledge, which makes the practice very easy; but
in case the multiplicand should have more than nine-
places, that upper face of the box may be made broader.
Some make the rods with four different faces,
and figures on each for different purposes.

Division by Neper's rods. First tabulate your divi
er; then you have it multiplied by all the digits, out
of which you may chuse such convenient divisors as
will be next less to the figures in the dividend, and
write the index anfwerinc in the quotient, and so continually
till the work is done. Thus 2179788, divided by
6123, gives in the quotient 356.

Having tabulated the divisor 6123, you see that
6123 cannot be had in 2179; therefore take five pla-
ce, and on the rods find a number that is equal or
next less to 21797, which is 18369; that is, 3 times the
divisor; wherefore set 3 in the quotient, and sub-
tract 18369 from the figures above, and there will
remain 3428; to which add 8, the next figure of the
dividend, and seek again on the rods for it, or the
next less, which you will find to be five times; there-
fore set 5 in the quotient, and subtract 30615 from
34288, and there will remain 3673; to which add 8,
the half figure in the dividend, and finding it to be just
6 times the divisor, set six in the quotient.

\[
\begin{array}{c}
6123 \\
2179788 \\
\text{(356)} \\
18369\
\end{array}
\]
\[
\begin{array}{c}
34288 \\
30615 \\
36738 \\
36738 \\
00000
\end{array}
\]

NEPETA, in botany, a genus of the didynamta gymno-
sperma class. The intermediate lacinium of the inferior
lip is crenated; the margin of the faus is reflected; and
the laminas are near each other. There are 14 species,
one only of which, viz. the cataria, nap, or cat-mint,
is a native of Britain.

NEPHEW, a term relative to uncle and aunt, signifying
a brother or sister's son; who, according to the civil
law, is in the third degree of consanguinity; but according
to the canon, in the second.

NEPHRITIC, something that relates to the kidneys.

NEPHRIC WOOD, a wood of a very dense and compact
texture, and of a fine grain, brought us from New Spain,
in small blocks, in its natural state, and covered with
its bark.

This wood is a very good diuretic, and is said to be
of great use with the Indians in all diseases of the kidneys and bladder, and in suppurations of urine, from whatever cause. It is also recommended in fevers and obstructions of the viscera. The way of taking it, among the Indians, is only an infusion in cold water.

**Nephritics**, in pharmacy, medicines proper for diseases of the kidneys, especially the stone.

Such particularly are the roots of althaea, dog's grafts, asparagus, fago, pellitory of the wall, malows, pin-pinilla, red chick peas, peach kernels, turpentine, the nephritic stone, the nephritic wood, &c. and diabetic.

**Nephritis**, in medicine, an inflammation of the kidneys.

**Nereis**, in zoology, a genus belonging to the order of Nephritics.

**Nereids**, in the pagan theology, sea-nymphs, daughters of Nereus and Doris.

The nereids were esteemed very handsome; so much that Calliope, the wife of Cepheus king of Ethiopia, having triumphed over all the beauties of the age, and daring to vie with the nereids, they were so enraged that they sent a prodigious sea-monster into the country; and to appease them, she was commanded by the oracle to expose her daughter Andromeda, bound to a rock, to be devoured by the monster.

In ancient monuments the nereids are represented riding upon sea horses, sometimes with an entire human form, and at other times with the tail of a fish.

**Nereis**, in zoology, a genus belonging to the order of vermese mollusca. The body is oblong, linear, and fitted for creeping; it is furnished with lateral pincelled tentacula. There are eleven species.

**Nerica**, a province of Sweden, bounded by Wefima on the north, by Sunderland on the south, and by Gotland on the south and west.

**Nerium**, in botany, a genus of the pentandria monogynia class. The seeds are furnished with plumes; and the tube of the corolla terminates in a lacerated corona. There are four species, none of them natives of Britain.


**Nest.** See Nidus.

**Nestorians**, a Christian sect, the followers of Ne-florus, bishop and patriarch of Constantinople; who, about the year 529, taught that there were two persons in Jesus Christ, the divine and the human, which are united, not hypothetically or substantially, but in a mystical manner; whence he concluded, that Mary was the mother of Christ and not the mother of God. For this opinion, Nestorius was condemned and deposed by the council of Ephesus; and the decree of this council was confirmed by the emperor Theodosius, who banished the bishop to a monastery.

**Netherlands**, anciently called Belisia, but since denominated Low-Countries or Netherlands from their low situation, are situated between 0° and 7° of east longitude; and between 50° and 53° 30' of north latitude; and are bounded by the German sea on the north, Germany on the east, by Lorrain and France on the south, and by another part of France and the British seas on the west; extending near three hundred miles in length from north to south, and two hundred miles in breadth from east to west. The confit of seventeen provinces; ten of which are called the Austrian and French Netherlands, and the other seven the United Provinces.

**Nettings**, in a ship, a sort of grates made of small ropes tied together with rope-yarn or twine, and fixed on the quarters and in the tops; they are sometimes stretched upon the ledges from the wade trees to the roof trees, from the top of the forecastle to the poop; and sometimes are laid in the wale of a ship, to serve instead of gratings.


**Netzuno**, a port town of Italy, in the Campagna di Roma, situated on the Mediterranean, thirty miles south-east of Rome.

**Nevens**, a city of France, capital of the Nivernois:

**Neufchatel**, the capital of the counties of Neufchatel and Vallengin, in Switzerland.

**Neuilly**, a town of Normandy in France, twenty-three miles north-east of Rouen.

**Nevin, or Newin**, a market town of North Wales, eighteen miles south west of Caernarvon.

**Nevis**, one of the Caribbee-islans, divided from the east end of St. Christophers by a narrow channel.

**Neurada**, in botany, a genus of the decandra decagynia class. The calix consists of five segments, and the corolla of five leaves; the capsule has ten cells, and ten sharp-pointed seeds. There is but one species, a native of Egypt.

**Neuratics**, in pharmacy, medicines good in disorders of the nerves.


**Neustat**, a city of Germany, thirty miles south of Vienna.

**Neustat** is also a town of Lower Saxony, sixteen miles north-west of the city of Hanover.

**Neuter, or Neuter gender**, in grammar, one of the three genders of nouns, so called as being neither masculine nor feminine. See Grammar.

**Neutrals salts**, among chemists, a sort of salts neither acid nor alkaline, but partaking of the nature of both. See Chemistry.

**Neutrality**, the state of a person or thing that is neuter, or that takes part with neither side.

**Newark**, a borough town of Nottinghamshire, fifteen miles north-east of Nottingham. In sends two members to parliament.

**Newborough**, a market town of Anglesey, fifteen miles north-west of Beaumaris.

**Newburg, a city of Bavaria, in Germany, twenty-eight miles north-east of Augsburg.**

**Newburg** is also the name of two other towns of Germany.
many; one in Swabia, twenty five miles west of Stuttgart; and the other likewise in Swabia, twelve miles north of Bassil.

NEWBURY, a market town of Berkshire, fifteen miles west of Reading.

NEWCASTLE, the county-town of Northumberland, situated upon the river Tyne: W. long. 1° 10', N. lat. 55’. It sends two members to parliament.

NEWCASTLE, a borough-town of Staffordshire, ten miles north of Stafford. It sends two members to parliament.

NEWCASTLE, a market town of Caernarvonshire, in South Wales, fifteen miles north of Caernarthen.

NEWEL, in architecture, is the upright post which a pair of winding stairs turn about; this is properly a cylinder of stone, which bears on the ground, and is formed by the end of the steps of the winding stairs.

NEWFIDLERS SEA, a lake thirty five miles long, on the north-west part of Upper Hungary.

NEW FOREST, a part of Hampshire, opposite to the Isle of Wight, appropriated by act of parliament for the growth of oaks to build the royal navy. See Forest.

NEWFOUNDLAND, a triangular island, three hundred and fifty miles in length from north to south, and two hundred miles in breadth at the base from east to west; situated in North America, between 55° and 61° of west longitude, and between 47° and 52° of north latitude; bounded by the narrow straits of Belleisle on the north, by the Atlantic ocean on the east and south, and by the bay of St. Lawrence on the west. It is subject to England; but the fishing banks on this coast are frequented by most European nations.

NEWHAUSEL, a city of Upper Hungary, situated on the river Neytra: E. long. 18° 12’, N. lat. 48° 24’.

NEWMARK, a city of Transylvania, subject to the house of Austria: E. long. 23° 25’, N. lat. 47° 35’.

NEWMARK is also a town of Germany in the palatinate of Bavaria, thirty miles north-west of Ratibon.

NEWMARKET, a market town, situated both in Cambridgeshire and Suffolk, twelve miles east of Cambridge.

NEWNHAM, a market town, ten miles south-west of Gloucester.

NEWPORT, a port town of Flanders, nine miles south-west of Oostend.

NEWPORT is also a borough town of the Isle of Wight, which sends two members to parliament.

NEWPORT is also a borough of Cornwall, ten miles west of Launceston, which sends two members to parliament.

NEWPORT is also the name of several market towns; one fifteen miles east of Shrewsbury, another eighteen miles south-west of Monmouth, and a third sixteen miles north-east of St Davids.

NEWPORT-PAGNEL, a market-town, sixteen miles north of Allibury.

NEWSTAT, the name of several towns; one eight miles north of Landau; another fifteen miles south-west of Ratibon; a third in Silesia, fifteen miles south of Breslau; a fourth in Hungary, sixty-five miles east of Tockay; and a fifth in Moravia, ten miles north of Olmutz.

NEWT, or EFT, in zoology. See Lacerta.

NEWTON, a borough town, thirty five miles south of Lancaster.

It sends two members to parliament.

NEWTON is also a borough town in the Isle of Wight, twelve miles south of Southampton; it sends two members to parliament.

NEWTONIAN PHILOSOPHY, the doctrine of the universe, and particularly of the heavenly bodies, their laws, affections, &c. as delivered by Sir Isaac Newton. See Astronomy, Mechanics, Optics, &c.

NEYLAND, a market-town of Suffolk, fourteen miles south-west of Ipswich.

NIAGARA, a prodigious cataract in Canada, in North America, between the lakes Erie and Ontario, where the water falls from high rocks 156 feet perpendicular. The mist which this fall occasions may be seen at fifteen miles distance rising as high as the clouds, and forming a beautiful rainbow.

NIBANO, a town of Italy, in the duchy of Parma, thirty five miles west of Parma.

NICARAGUA, a province of Mexico, bounded by the province of Honduras on the north, by the North sea on the east; by the province of Costa Rica on the south-east, and by the South sea on the south-west; being 400 miles long, and 120 broad. Nicargua lake runs through the middle of the province.

NICARIA, one of the islands of the Archipelago, in Asiatic Turkey: E. long. 25° 5’, N. lat. 37°.

NICASTRO, a town of Naples, in the territory of Casabia; E. long. 16° 40’, N. lat. 39° 15’.

NICE, the capital of the county of the same name, situated on the Mediterranean, at the mouth of the river Var: E. long. 7° 15’, N. lat. 43° 40’.

NICE is also a town of Asiatic Turkey, fifty miles south-east of Constantino-pole.

NICHE, in architecture, a hollow sunk into a wall, for the commodious and agreeable placing a statue.

NICOBAR ISLANDS, a cluster of islands situated in the Indian ocean, at the entrance of the gulf of Bengal, between 9° and 10° N. lat.

NICOLAITANS, in church-history, Christian heretics who assumed this name from Nicolas of Antioch; who, being a Gentile by birth, first embraced Judaism, and then Christianity; when his zeal and devotion recommended him to the church of Jerusalem, by whom he was chosen one of the first deacons. Many of the primitive writers believe that Nicolas was rather the occasion than the author of the infamous practices of those who assumed his name, who were expressly condemned by the spirit of God himself, Rev. ii. 6. And indeed their opinions and actions were highly extravagant and criminal. They allowed a community of wives; made no difference between ordinary meats and those offered to idols. According to Eusebius, they subsisted but a short time; but Tertullian says, that they only changed their name, and that their heresies passed into the sect of the Caunitans.
St. NICOLAS, a town of Lorrain, ten miles south-east of Nancy, at the mouth of the river Divin.

St. Nicholas is also a port-town of Russia situated on the White sea, six miles below Archangel.

St. Nicholas's Day, a festival of the Roman church, observed on the 6th of December.

NICOMEDIA, a city of Asia Minor, thirty miles south-east of Constantinople.

NICOPOLIS, a city of Europe, situated on the Danube, 100 miles north west of Adrianople: E. long. 23°, N. lat. 43°.

NICOPPING, a city of Sweden, in the province of Sunderland, fifty miles south of Stockholm.

Nicopling is also the capital of the island Hulfer, subject to Denmark, and forty-eight miles south-west of Copenhagen.

NICOSIA, the capital of the island of Cyprus: E. long. 33°, N. lat. 35°.

NICOTERA, a port town of the kingdom of Naples, thirty miles north east of Reggio.

NICOTIANA, in botany, a genus of the pentandria monogynia class. The corolla is funnel-shaped, with a plaited limbus; the stamens are inclined; and the capsule has two valves and two cells. There are 7 species, all natives of warm climates. The nicotiana tabacum, or tobacco, was first brought into Europe about the year 1560, from the island Tobago in America. It is cultivated in the following manner.

After sowing the tobacco seed, the ground is watered every day, and in hot weather covered to prevent its being scorched by the sun; and when the plants are grown to a convenient pitch, they are transplanted into a soil well prepared for their reception: care is also taken to keep this ground clear of weeds, and to pull off the lowest leaves of the plant, that ten or fifteen of the finest leaves may have all the nourishment. When these leaves are ripe, which is known by their breaking of a pinch in the air, and when the leaves are sufficiently dried, they are pulled from off the stalks, and made up in little bundles; which being steeped in seawater, or, for want thereof, in common water, are twisted in manner of ropes, and the twis formed into rolls, by winding them with a kind of string around a stick: in which condition it is imported into Europe, where it is cut by the tobacconists for smoking, formed into snuff, and the like. See Snuff.

Besides the tobacco of the West-Indies, there are considerable quantities cultivated in the Levant, the coasts of Greece and the Archipelago, the island of Malta and Italy.

The marks of good twist-tobacco, are a fine shining cut, an agreeable smell, and that it has been well kept. Tobacco is either taken by way of snuff, as a snuffitory; or as a medlar, by chewing it in the mouth; or by smoking it in a pipe. It is sometimes also taken in longish pellets put up the nose, where it is found to produce very good effects, to attract a deal of water or pituita, unload the head, resolve catarrhs, and make a free respiration; for the subtle parts of the tobacco in inspiration, are carried into the trachea and lungs, where they loosen the peccant humours adhering there-to, and promote expectoration. Some have left this tobacco in their noses all night; but this is found to occasion vomiting the next morning. Another thing charged on this way of application, is, that it weakens the sight. When taken in great quantities in the way of snuff, it is found to prejudice the smelling, greatly diminishes the appetite, and in time gives rise to a phthisis. That taken in the way of smoke, dries and damages the brain. Borrhii, in a letter to Bartholine, mentions a person who through excess of smoking had dried his brain to that degree, that after his death there was nothing found in his skull but a little black lump, consisting of mere membranes.

Some people use the infusion of tobacco as an emetic; but it is a very dangerous and unjustifiable practice, and often produces violent vomiting, sickness, and stupidity. Bates and Fuller give some receipts, in which tobacco is an ingredient, with mighty encomiums in aphthous cases. A strong decoction of tobacco, with proper carminatives and cathartics, given at the right time, sometimes proves of good effect in what is usually called the stomatitis, and also in the diac passions. A drop or two of the chymical oil of tobacco, being put on the tongue of a cat, produces violent convulsions, and death itself in the space of a minute; yet the same oil used in lint, and applied to the teeth, has been of service in the tooth-ache: though it must be to those that have been used to the taking of tobacco; otherwise, great sickness, reachings, vomitings, &c. happen; and even in no case is the internal use of it warranted by ordinary practice.

A strong decoction of the stalks, with sharp-pointed dock and alum, is said to be of good service, used externally, in cutaneous diseases, especially the itch: some boil them for that purpose in urine. The same is said to be infallible in curing the mange in dogs.

Beat into a mush with vinegar, or brandy, it has been found serviceable for removing hard tumours of the hypochondria.

NICOYA, or ST LUCAR, a port-town of Mexico, situated on a bay of the South Sea, in 98° W. long. and 10° 15' N. lat.

NICTITATING MEMBRANE, a thin membrane, chiefly found in the bird and fish kind, which covers the eyes of these animals, sheltering them from the dust or too much light; yet is so thin and pellucid, that they can see pretty well through it.

NIDUS, among naturalists signifies a nest, or proper repository for the eggs of birds, insects, &c., wherein the young of these animals are hatched and nurfed.

NIECE, a brother or sister's daughter, which in the civil law is reckoned the third degree of consanguinity.

NIEMEN, or BEREZINA, a river of Poland, which rises in Lithuania, and falls into a bay of the Baltic sea, near Memel.

NIEPER, or BorystheneS, a river which rises in the middle of Russia, and running south through Poland, enters...
enters the Russian Ukraine, separates Little Tartary from
Budziac Tartary, and falls into the Black Sea near
Oezkow.

NIFESTAT, a town of Lower Saxony, in the duchy of
Mecklenburg: E. long. 11° 26', N. lat. 53° 40'.

NIFESTAT is also a town of Upper Saxony, in the mar-
quarite of Brandenburg, 25 miles north-east of Berlin.

NIESTER, a river which rises in Poland, and running
south east divides Podolia in Poland from Moldavia
in Turkey; and afterwards, dividing Bessarabia from
Budziac Tartary, falls into the Black Sea near Bel-
gorod.

NIGELLA, in botany, a genus of the polyandria penta-
gynia class. The calix is wanting; the corolla con-
stitutes five petals; there are five trifid gynia within
the corolla; and there are five connected capsules. The
species are five, none of them natives of Britain.

NIGER, a great river of Africa, which runs from eaf
to west through the middle of Negroland, and dis-
charges itself into the Atlantic ocean by three channels,
called Rio Grande, Gambia, and the river Senega.

NIESTAT is also a town of Upper Saxony, in the mar-
quarite of Brandenburg, 25 miles north-east of Berlin.

NIGHT, that part of the natural day during which the
sun is underneath the horizon; or that space wherein
it is dark.

Night was originally divided by the Hebrews, and
other eastern nations, into three parts; or watchings.
The Romans, and afterwards the Jews from them,
divide the night into four parts, or watches, the first
of which began at sunset and lasted till nine at night,
according to our way of reckoning; the second lasted
till midnight; the third till three in the morning; and
the fourth ended at sunrife. The ancient Gauls and
Germans divided their time, not by days, but by nights;
and the people of Iceland, and the Arabs, do the fame
at this day. The like is also observed of our Saxons
ancestors.

Night-seat, in law. See Medicine, p. 157.

Night-walkers. See Noctambuli.

NIGHTINGALE, in ornithology. See Motacilla.

NIGRITIA, in onothology. See Motacilla.

NILE, a great river in Egypt, having its source in A-
byllia, or the Upper Ethiopia, in 12° north lat. It
generally runs from south to north through Abyssinia
into Egypt, and then continues its course north in one
stream till it comes below Cairo to the Delta, where
it divides; one branch discharging itself into the Me-
diterranean at Damietta, and another a hundred miles
above the weirward of it at Rosetta. There are great
rejoicings every year when the Nile rises to a certain
height, their future harvest depending upon it. The
just height of the inundation, according to Pliny, is
sixteen cubits; when it rises but to twelve or thir-
ten, a famine is dreaded; and when it exceeds six-
ten, there is also danger apprehended. The river
begins usually to rise in May or June, and is conveyed
by reservoirs, cisterns, and canals, to the fields and
gardens as they want it.

As to the Delta, it is all overflowed.

NIMBUS, in antiquity, a circle observed on certain
medals, or round the head of some emperors, answer-
ing to the circles of light, drawn around the images
of saints.

NIMEGUEN, a city of the united Netherlands, situ-
ated on the river Waal, in the province of Guelders,
52 miles north-east of Amsterdam.

NIMETULAHITES, a kind of Turkish monks, so
called from their founder Nimetulahi, famous for his
doctrines and the austerity of his life.

NIMO, a small Turkish island in the Archipelago, situa-
ted north-west of Santorini, remarkable for little but the
tomb of Homer, who is said to lie buried here.

NIORT, a town of France, in the province of Orlé-
ansois and territory of Poitou, situated on the river
Sevre, twenty eight miles north-east of Rochelle.

NIPHON, the largeft of the Japan islands, situatecl in
the Indian ocean about 130 miles east of Chiná; be-
ing 600 miles long, and 150 broad, and containing 55
provinces.

NIPPERS, in the menage, are four teeth in the fore-
part of a horse's mouth, two in the upper and two in
the lower jaw. A horse puts them forth between the
fecond and third year.

NIPPLES, in anatomy. See Anatomy, p. 277.

Nipple-wort, in botany. See Lapiana.

NISI PRIUS, in law, a judicial writ which lies in cafes
where the jury being impannelled and returned before
the juftices of the bank; one of the parties requests to
have such a writ, for the ease of the country, in or-
der that the trial may come before the juftices in the
fame county on their coming thither. The purport
of a writ of nisi prius is, that the sheriff is thereby
commanded to bring to Weftrinfter the men impa-
nelled, at a certain day, before the juftices, " nisi prius
jufticiarii domini regis ad affisas capitndas venerint."

NISMES, a fine city of France, in the province of Lan-
gu doc: E. long. 4° 26', N. lat. 45° 40'.

NISNA, or Nise Novogorod, the capital of the
province of Nise, or Little Novogorod, in Russia: E.
long. 45°, N lat. 56°.

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NISNA, or Nise Novogorod, the capital of the
province of Nise, or Little Novogorod, in Russia: E.
long. 45°, N lat. 56°.

NISUA, a city of European Turkish, in the province of
Servia: E. long. 23°, N. lat. 43°.

Nissa or Nizza, a town of Italy, in the duchy of
Montferrat: E. long. 8° 40', N. lat. 45° 45'.

NITHSDALE, a county of Scotland, bounded by
Clydesdale on the north, by Annandale on the east,
by Solway frith on the south, and by Galloway on the
west.

NITRACHT, or Nytrea, a town of Hungary, forty
miles north-east of Pestburg.

NITRE, or Salt-petre. See Chemistry, p. 73. 119.
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NIUCHE, a kingdom of Chinese Tartary, north of the province of Laotung.

NIVELLE, a town of the Austrian Netherlands, and province of Brabant, fourteen miles south of Brussels.

NISABOUR, or Nisabour, a city of Persia, in the province of Chorassan: E. long. 57° 32', N. lat. 33° 49'.

NOBILIARY, in literary history, a book containing the history of the noble families of a nation, or province: such as Chorier's Nobiliary of Dauphine, and Caumartin's Nobiliary of Provence. The Germans are said to be particularly careful of their nobiliaries, in order to keep up the purity of their families.

NOBILITY, a quality that ennobles, and raises a person to the rank of a commoner.

The origin of nobility in Europe is by some referred to the Goths; who, after they had feized a part of Europe, rewarded their captains with titles of honour, to distinguish them from the common people. In Britain the term nobility is referred to degrees of dignity above knighthood; but every where else nobility and gentility are the same. The British nobility consists only of five degrees, viz. that of a duke, marquis, earl or count, viscount, and baron, each of which fee under their proper articles.

NOBLE, a money of account containing six shillings and eight-pence.

The noble was anciently a real coin struck in the reign of Edward III. and then called the penny of gold; but it was afterwards called a rofe-noble, from its being stamped with a rofe: it was current at 6s. 8d.

Terra NOCERIANA, earth of Nocera, in the province of Chorassan; E. long. 57° 32', N. lat. 33° 49'.

NOCTAMBULI, or Nightwalkers, in medicine, nocturnal, Noctilucum, an instrument chiefly used at sea, to take the latitude or depression of some stars about the pole, in order to find the latitude and hour of the night.

Some nocturnals are hemispheres, or planispheres, on the plane of the equinoctial. Those commonly in use among seamen are two; the one adapted to the polar star, and the first of the guards of the little bear; the other to the pole-star, and the pointers of the great bear.

This instrument consists of two circular plates, (Plate CXXXIV. fig. 2.) applied to each other. The greater, which has a handle to hold the instrument, is about 1½ inches diameter, and is divided into twelve parts, agreeing to the twelve months; and each month subdivided into every fifth day; and so as that the middle of the handle corresponds to that day of the year wherein the star here regarded has the same right ascension with the sun. If the instrument be fitted for two stars, the handle is made moveable. The upper left circle is divided into twenty four equal parts for the twenty four hours of the day, and each hour subdivided into quarters. These twenty four hours are noted by twenty four teeth to be told in the night. Those at the hours 12, are distinguished by their length.

In the centre of the two circular plates is admitted a long index, A, moveable upon the upper plate. And the three pieces, viz. the two circles and index, are joined by a rivet which is pierced through the centre with a hole, through which the star is to be observed.

To use the Nocturnal, turn the upper plate till the long tooth, marked 12, be against the day of the month on the under plate; then, bringing the instrument near the eye, suspend it by the handle with the plane nearly parallel to the equinoctial, and viewing the pole-star through the hole of the centre, turn the index about till, by the edge coming from the centre, you see the bright star or guard of the little bear (if the instrument be fitted to that star; ) then that tooth of the upper circle, under the edge of the index, is at the hour of the night on the edge of the hour circle, which may be known without a light, by counting the teeth from the longest, which is for the hour 12.

NODATED HYPERBOLA, a name given by Sir Isaac Newton, to a kind of hyperbola, which, by turning round, decussates or crosses itself.

NODE, a tumour arising on the bones, and usuallie proceeding from some venereal cause; being much the same with what is otherwise called exoftosis.

NODES. See Astronomy, p. 477.

NODUS, or Node, in dialling, a certain point or pole in the gnomon of a dial, by the shadow or light whereof either the hour of the day in dials without furniture, or the parallels of the sun's declination, and his place in the ecliptic, &c., in dials with furniture, are shown. See Dialling.

NOETIANS, in church history, Christian heretics in the IIIrd century, followers of Noetius, a philosopher of Ephesus, who pretended that he was another Moses, sent by God; and that his brother was a new Aaron. His heresy consisted in affirming that there was but one person in the Godhead; and that the Word and the Holy Spirit were but external denominations, given to God, in consequence of different operations; that as Creator, he is called Father; as Incarnate Son; and as ascending on the apostles, Holy Ghost.

NOGAIAN TARTARS, a nation which inhabits that part of Circasia, in Asiatic Turkey, that lies between the Palus Meotis and the Caspian sea.

NOGENT, a town of France, in the province of Champagne, situated on the river Seine, twenty five miles north-west of Troyes.
NOLA, a town of Italy, in the kingdom of Naples, situated 16 miles east of Naples.

NOLI, a town of Italy in the territory of Genoa, situated on the bay of Genoa, thirty-five miles south west of that city.

NOMARCHA, in Egyptian antiquity, the governor or commander of a nome. Egypt was anciently divided into several regions or quarters, called nomes.

NOMBRE DE DIO, a town of Mexico, in the province of Darien, a little to the eastward of Porto Bello: W. long. 83°, and N. lat. 10°.

NOMBREL POINT, in heraldry, is the next below the feast point, or the very centre of the escutcheon. See Point.

Supposing the escutcheon divided into two equal parts below the feast, the first of these divisions is the nombrel, and the lower the base.

NOME, or NAME, in algebra, denotes any quantity with a sign prefixed or added to it, whereby it is connected with some other quantity, upon which the whole becomes a binomial, trinomial, or the like. See Algebra.

NOMENCLATOR, in Roman antiquity, was dually the fes point, or the very centre of the escutcheon. See Point.

NOMENCLATURE, a catalogue of several of the more usual words in any language, with their significations, compiled in order to facilitate the use of such words to those who are to learn the tongue: such are our Latin, Greek, French, &c. nomenclatures.

NOMINALS, Nominalists, a sect of school philosophers, the disciples and followers of Occam, or Ocham, an English cordelier, in the XIVth century. They were great dealers in words, whence they were vulgarly denominated word-fellers; but had the denomination of nominalists, because that, in opposition to the realists, they maintained that words, and not things, were the object of dialectics.

NOMINATIVE, in grammar, the first case of nouns which are declinable. See Grammar.

NONAGE, in law, generally signifies all the time a person continues under the age of one and twenty; but in a special sense, it is all the time a person is under the age of fourteen.

NON-CAPES, in geography, a promontory on the west coast of Africa, opposite to the Canary islands.

NON-ENTRY, in Scots law. See Law, Tit. xii. 5.

NON-NATURALS, in medicine, so called because by their abuse they become the causes of diseases.

Physicians have divided the non-naturals into six classes, viz. the air, meats and drinks, sleep and watching, motion and rest, the passions of the mind, the retenions and excretions.

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Non-suit, signifies the dropping of a suit or action, or a renouncing thereof by the plaintiff or defendant.

NONCONFORMISTS. See Dissenters.

NONE, one of the seven canonical hours in the Roman church, answering to three o'clock in the afternoon.

NONES, in the Roman calendar, the fifth day of the months January, February, April, June, August, September, November, and December; and the seventh of March, May, July, and October. March, May, July, and October, had six days in their nones; because these alone, in the ancient constitution of the year by Numa, had thirty-one days a-piece, and February thirty; but when Cæsar reformed the year, and made other months contain thirty-one days, he did not allot them six days of nones. See Calendar.

NORDEN, a port-town of Germany, in the circle of Weilphalia, and county of Embden, twelve miles north of Embden.

NORFOLK, a county of England, bounded by the German sea on the north and east; by Suffolk on the south, and by the fens of Lincolnshire and the isle of Ely on the west.

NORFOLK, a county of Virginia, north of Carolina, and contiguous to that province.

NORMANDY, a province of France, bounded by the east channel on the north, by Picardy and the isle of France on the west, by Britany and another part of the east channel on the west.

NORROY, the title of the third of the three kings at arms.

NORTH, one of the four cardinal points. See Navigation.

North Curry, a market-town of Somerfetshire, seven miles south-west of Wells.

North Foreland, a cape in the isle of Thanet, on the east coast of Kent, four miles east of Margate.

North Sea, a name given to all that part of the Atlantic Ocean which lies north of Terra Firma, in South America.

North-west Passage. A north-west passage by Hudson Bay, into the pacific ocean, has been more than once attempted of late years, but hitherto without success. Some greatly doubt of the practicableness of such an enterprise, and think the observations made by the Russians give us small hopes. Some general things may be seen in the Phil. Trans. N° 482. sect. 14. It appears from thence, that the Russians have passed between the land of Nova Zeltha, and the coast of Asia; and, as the Dutch did formerly discover the northern coasts of Nova Zelbha, we may now be well assured that that country is really an island.

NORTHALLERTON, a borough-town of the north riding of Yorkshire, twenty-two miles north-west of York. It sends two members to parliament.

NORTHAMPTON, the capital of Northamptonshire, situated on the river Nen: W. long. 55°, and N. lat. 52° 15'. It sends two members to parliament.

NORTHAMPTON, is also a county of Virginia, in North America.
America, which forms the south part of the peninsula on the eastern shore of Virginia.

NORTHUMBERLAND, a county of England, bounded on the north by Scotland, on the east by the German sea, on the south by Durham, and on the west by Cumberland and part of Scotland. Norfolk.

NORWICH, a large city of great trade in Norfolk.

NORTHUMBERLAND is also a county of Virginia, lying at the mouth of the river Patowmac.

NORTHWICH, a market town of Cheshire, sixteen miles north-east of Chester.

NORWAY, a kingdom of Europe, situated between 20° and 70° north latitude, bounded by the Atlantic ocean on the north and west, by Swedish Lapland and other provinces of Sweden on the east, and by the sea called the Cattegate and Schaggeric on the south. It is a cold barren country, subject to Denmark.

NOTATION, in arithmetic. See Arithmetic, p. 366.

NOTARY, signifies a person, usually some scrivener, who takes notes, or frames short drafts, of contracts, obligations, charter-parties, or other writings.

NOTATION, in musick, characters which mark the sounds, i.e. the elevations and fallings of the voice, and the swiftness and slowness of its motions. See Musick.

Note is likewise used for a mark made in a book or writing where there occurs something remarkable and worthy of particular notice: as also for an observation or explication of some passage in an author added in the margin, at the bottom of the page, or elsewhere, in which sense it stands contradistinguished to text.

Note, is also a minute, or short writing, containing some article of business, in which sense we say, promissory note, note of hand, bank note, &c.

NOTUS, signifies spurious or bastard; whence it is figuratively applied by physicians, &c. to such diseases as though in respect of a similitude of symptoms, &c. they have the same denomination as some others, yet are of a different origin, feat, or the like, from the same.

NOTION, in logic, an idea or representation of anything in the mind. See Logic and Metaphysics.

NOTITIA, in literary history, a book that gives an account of a particular country, city, or other place: such is the Notitia Imperii Romani, Notitia Romae Antique, &c.

NOTO, the capital of a province of the same name in Sicily, twenty miles south of Syracuse, E. long. 15°, N. lat. 37° 15'.

NOTONECTA, the Boat-fly a genus of insects belonging to the order hemiptera. The beak is inflecd; the antennae are shorter than the thorax; the four wings are plaited cross-ways; and the feet are hairy, and fitted for swimming. There are three species, distinguished by their colour.

NOTTEBURG, a city of Russia, situated on an island in the lake Lodoga, twenty five miles east of Peterburg.

NOTTINGHAM, the capital of Nottinghamshire, situated about a mile north of the river Trent; W. long. 1° 5', N. lat. 53°. It sends two members to parliament.

NOVA-SCOTIA. See Scotland.

NOVA-ZEMBLA, or Newland, called by the Dutch the island of Weygats, is situated in the frozen ocean, between 50° and 80° east longitude, and between 70° north latitude and the north pole: it is separated from the province of Samoidea, in Russia, by the straits of Weygats.

NOVARA, the capital of the Novarese, in the duchy of Milan.

NOVATION, or Innovation, in the civil law, denotes the change of one kind of obligation for another; as when a promise is accepted instead of a written obligation.

NOVATION, in Scots law. See Law, Tit. xxiii. 7.

NOVEL, in matters of literature, a fictitious history of a series of entertaining events in common life, wherein the rules of probability are or ought to be strictly preferred.

NOVELLARA, a town of Italy, in the duchy of Mantua, twenty miles south of the city of Mantua.

NOVEMBER, in chronology, the eleventh month of Romulus's year, which began with March.

NOVEMVIRI, the nine magistrates of Athens, more usually called archons.

NOVIGRAD, a town of Dalmatia, in 17° 30' E. long. and 44° 30' N. lat.

NOOUN, in grammar, a part of speech, which signifies things without any relation to time; as a man, a house, sweet, bitter, &c. See Grammar.

NOVOGOROD, the capital of a province of the same name in Muscovy, situated on the river Wolcoff, 130 miles...
miles south east of Petersburg; E. long. 34°, N. lat. 58°.
It is an archbishop’s see, and has 180 churches and monasteries.

**NOVOGRODECK**, a city of Lithuania, in Poland: E. long. 25° 20', N. lat. 53° 45'.

**NOURISHMENT.** See Nutrition.

**NOWED,** in heraldry, signifies knotted, from the Latin nodatus; being applied to the tails of such creatures as are very long, and sometimes represented in coat-armour, as if tied up in a knot.

**NUBIA,** a country of Africa, bounded by the desert of Barca, on the north; by Egypt and Abyssinia, on the east; by the Lower Ethiopia, on the south; and by the deserts of Africa, on the west.

**NUCHA,** the nape of the neck.

**NUCIFEROUS** trees, such as bear nuts.

**NUCHTA,** the nape of the neck.

**NUCLEUS,** in general denotes the kernel of a nut, or even any seed inclosed within a husk.

The term nucleus is also used for the body of a comet, otherwise called its head. See Astronomy, p. 444.

**NUDITIES,** in painting and sculpture, denotes those parts of an human figure which are not covered with any drapery; or those parts where the carnation appears.

**NULLITY,** in law, signifies anything that is null or void: thus there is a nullity of marriage, where persons marry within the degrees, or where infants marry without consent of their parents or guardians.

**NUMBER.** See Arithmetic.

**Golden Number.** See Astronomy, p. 495.

**Number,** in grammar, a modification of nouns, verbs, &c. to accommodate them to the varieties in their objects, considered with regard to number. See Grammar.

**Numbers,** in poetry. See Versification.

**Book of Numbers,** the fourth book of the Pentateuch, taking its denomination from its numbering the families of Israel.

A great part of this book is historical, relating to several remarkable passages in the Israelites march through the wilderness. It contains a distinct relation of their several movements from one place to another, or the two and forty stages through the wilderness, and many other things, whereby we are instructed and confirmed in some of the weightiest truths that have immediate reference to God and his providence in the world. But the greatest part of this book is spent in enumerating these laws and ordinances, whether civil or ceremonial, which were given to God, but not mentioned before in the preceding books.

**NOMENIUS,** in ornithology, a genus of birds of the order of the falcopaces; the beak of which is of a figure approaching to a cylindrical one; it is obtuse at the point, and is longer than the toes; the feet have each 4 toes, connected together. This genus comprehends the curlew, the woodcock, the great plover, and the snipe. See Curlew, &c.

**NUMERAL LETTERS,** those letters of the alphabet which are generally used for figures; as I, one; V, five; X, ten; L, fifty; C, a hundred; D, five hundred; M, a thousand; &c.

**NUMERATION,** or Notation, in arithmetic. See Arithmetic, p. 366.

**NUMERATOR of a fraction.** See Arithmetic, p. 287.

**NUMERICAL, NUMEROUS, or NUMERAL,** something belonging to numbers; as numerical algebra is that which makes use of numbers, instead of letters of the alphabet. Also, numerical difference, is the difference whereby one individual is distinguished from another. Hence a thing is said to be numerically the same, when it is so in the strictest sense of the word.

**NUMIDIA,** in ornithology, a genus belonging to the order of gallinac. On each side of the head there is a kind of coloured fleshy horn; and the beak is furnished with cere near the nostrils. There is but one species, a native of Africa.

**NUMIDIA,** the ancient name of Biledulgerid, in Africa.

**NUMISMATOGRA PHIA,** a term used for the description and knowledge of ancient medals and coins, whether of gold, silver, or brass.

**NUMMUS,** among the Romans, a piece of money otherwise called festeritus.

**NUN,** a woman, in several Christian countries, who devotes herself, in a cloister or nunnery, to a religious life.

There were women in the ancient Christian church who made public profession of virginity before the monastic life was known in the world, as appears from the writings of Cyprian and Tertullian. These, for distinction’s sake, are sometimes called ecclesiastical virgins, and were commonly enrolled in the canon or matricula of the church. They differed from the monastic virgin chiefly in this, that they lived privately in their father’s houses, whereas the others lived in communities: but their profession of virginity was not so strict as to make it criminal in them to marry afterwards if they thought fit. As to the consecration of virgins, it had some things peculiar in it; it was usually performed publicly in the church by the bishop. The virgin made a public profession of her resolution, and then the bishop put upon her the accustomed habit of sacred virgins. One part of this habit was a veil, called the facrum velamen; another was a kind of mitre or coronet worn upon the head. At present, when a woman is to be made a nun, the habit, veil, and ring of the candidate are carried to the altar; and since herself, accompanied by her nearest relations, is conducted to the bishop, who, after mass and an anthem, the subject of which is, “that she ought to have her lamp lighted, because the bridegroom is coming to meet her,” pronounces the benediction: then she rises up, and the bishop consecrates the new habit, sprinkling it with holy water. When the candidate has put on her religious habit, she proceeds herself before the bishop, and stands on her knees, Anella Christi fum, &c. then she receives the veil, and afterwards the ring, by which she is married to Christ; and lastly the crown of virginity.

**N U M ( 495 ) **

**NUN**
NUNCIATION, or Nuntiation, an ambassador from the pope to some Catholic prince or state; or a person who attends on the pope's behalf at a congress, or an assembly of several ambassadors.

NUNCUPATIVE, in the schools, something that is only nominal, or has no existence but in name.

NUNCUPATIVE TESTAMENT, in Scots law. See Law, Tit. xxviii. 2.

NUDINAL, Nundinalis, a name which the Romans gave to the eight first letters of the alphabet, used in their calendar.

This series of letters, A, B, C, D, E, F, G, H, is placed and repeated successively from the first to the last day of the year: one of these always expressed the market days, or the assemblies called nundinals, quasi novendine, because they returned every nine days. The country people, after working eight days successively, come to town the ninth, to sell their several commodities, and to inform themselves of what related to religion and government. Thus the nundinal day being under A on the first, ninth, seventeenth, and twenty-fifth days of January, &c. the letter day will be the nundinal letter of the year following. These nundinals bear a very great resemblance to the dominical letters, which return every eight days, as the nundinals did every nine.

NUPTIAL RITES, the ceremonies attending the solemnization of marriage, which are different in different ages and countries.

NURENBERG, the capital of a territory of the same name, in the circle of Franconia, in Germany; E. long. 11°, N. lat. 49° 30'.

NURSERY, in gardening, is a piece of land set apart for raising and propagating all sorts of trees and plants, to supply the garden and other plantations. See Gardening.

NUSANCE, in law, a thing done to the annoyance of another.

Nusances are either public or private. A public nuisance is an offence against the public in general, either by doing what tends to the annoyance of all the king's subjects, or by neglecting to do what the common good requires: in which case all annoyances and injuries to streets, highways, bridges, and large rivers, as also disorderly ale houses, bawdy-houses, gaming-houses, stages for rope-dancers, &c. are held to be common nuisances. A private nuisance is when only one person or family is annoyed, by the doing of anything; as where a person fops up the light of another's house, or builds in such a manner that the rain falls from his house upon his neighbour's.

NUT, among botanists, denotes a pericarpium of an extraordinary hardness, including a kernel or seed.

NUTATION, in astronomy, a kind of tremulous motion of the axis of the earth, whereby, in each annual revolution, it is twice inclined to the ecliptic, and as often returns to its former position.

NUTMEG, the kernel of a large fruit, not unlike the peach.

The nutmeg is separated from its invenient coat, the mace, before it is sent over to us; except that the whole fruit is sometimes imported in preference, by way of sweetmeat, or as a curiosity. See Mace.

The nutmeg, as we receive it, is of a roundish or oval figure, of a tolerably compact and firm texture, but easily cut with a knife, and falling to pieces on a smart blow. Its surface is not smooth, but furrowed with a number of wrinkles, running in various directions, though principally longitudinally. It is of a greyish brown colour on the outside, and of a beautiful variegated hue within, being marbled with brown and yellow variegations, running in perfect irregularity through its whole substance. It is very unctuous and fatty to the touch, when powdered; and is of an extremely agreeable smell, and of an aromatic taste.

There are two kinds of nutmeg in the shops, the one called by authors the male, and the other the female. The female is the kind in common use, and is of the shape of an olive; the male is long and cylindrical, and has less of the fine aromatic flavour than the other; so that it is much less esteemed, and people who trade largely in nutmegs will seldom buy it. The longer male nutmeg, as we term it, is called by the Dutch the wild nutmeg. It is always distinguishable from the others, as well by its want of fragrance, as by its shape: it is very subject to be worm-eaten, and is strictly forbid, by the Dutch, to be packed up among the other, because it will give occasion to their being worm-eaten too, by the insects getting from it into them, and breeding in all parts of the parcel.

The largest, heaviest, and most unctuous of the nutmegs are to be chosen, such as are of the shape of an olive, and of the most fragrant smell. The Dutch import them from the East-Indies.

Nutmeg is greatly used in our foods, and is of excellent virtues as a medicine; it is a good stomachic, it promotes digestion, and strengthens the stomach. It also stops vomiting; is an excellent remedy in flatulences; and is happily joined with rhubarb, and other medicines, in diarrhœas. It is observed to have a soporific virtue, and to exert it too strongly, if taken in immoderate quantities. It has a considerable degree of astringency; and given, after tasting before the fire till thoroughly dry and crumbly, it has been sometimes known alone to cure diarrhœas.

NUTRITION, in the animal economy, is the repairing the continual loss, which the different parts of the body undergo. The motion of the parts of the body, the friction of these parts with each other, and especially the action of the air, would destroy the body entirely, if the loss was not repaired by a proper diet, containing nutritive juices; which being digested in the stomach, and afterwards converted into chyle, mix with the blood, and are distributed throughout the whole body for its nutrition.

In young persons, the nutritive juices not only serve to repair the parts that are damaged, but also to increase them, which is called growth.

In grown persons, the cuticle is every where constantly desquamating, and again renewing; and in the same manner the parts rubbed off, or otherwise separated...
rated from the flabby parts of the body, are soon supplied with new flesh; a wound heals, and an emaciated person grows plump and fat.

Buffon, in order to account for nutrition, supposes the body of an animal, or vegetable, to be a kind of mould, in which the matter necessary to its nutrition is modelled and assimilated to the whole. But, continues he, of what nature is this matter, which an animal, or vegetable, assimilates to its own substance? What power is it that communicates to this matter the activity and motion necessary to penetrate this mould? and, if such a force exist, would it not be by a similar force that the internal mould itself might be reproduced?

As to the first question, he supposes that there exists in nature an infinite number of living organical parts, and that all organized bodies consist of such organical parts; that their production costs nature nothing, since their existence is constant and invariable; so that the matter which the animal, or vegetable, assimilates to its substance, is an organical matter, of the same nature with that of the animal, or vegetable, which consequently may augment its volume, without changing its form, or altering the quality of the substance in the mould.

As to the second question: There exist, says he, in nature, certain powers, as that of gravity, that have no affinity with the external qualities of the body, but act upon the most intimate parts, and penetrate them throughout, and which can never fall under the observation of our senses.

And, as to the third question, he answers, that the internal mould itself is reproduced, not only by a similar power, but it is plain that it is the very same power that causes the unfolding and reproduction thereof: for it is sufficient, proceeds he, that in an organized body that unfolds itself, there be some part similar to the whole, in order that this part may one day become itself an organized body, altogether like that of which it is actually a part.

NUX PISTACHIA. See PISTACHIA.

NYBURG, a town of Germany, twenty miles north of Cologne.

NYBURG, a town of Denmark, situated at the east-end of the island of Fynen, ten miles east of Odense: E. long. 10°, N. lat. 55° 30'.

NYCHTHEMERON, the natural day, or day and night, which together always make twenty-four hours.

NYCTALOPIA, in medicine, a two-fold disorder of the eye, one of which is opposite to the other. In the first, the sight is best in the night, and in obscure places; whereas in a clear light their fight fails, so that they can hardly see any thing. In the other sort of nyctalopia, the patient can see nothing at all except in a clear and bright light.

NYCTANTHES, Arabian Jasmine, in botany, a genus of the diandria monogynia class. The calyx and like-wise the corolla consist of eight segments. There are five species, none of them natives of Britain.

NYCTICORAX, in ornithology. See Ardea.

NYLAND, a province of Finland, situated on the gulf of Finland, west of the province of Carelia.

NYMPH, in mythology, an appellation given to certain inferior goddesses inhabiting the mountains, woods, waters, &c. See Mythology.

NYMPH, among naturalists, that state of winged insects between their living in the form of a worm, and their appearing in the winged or most perfect state.

NYMPHÆA, the water-lily, in botany, a genus of the polyandria monogynia class. The corolla consists of many petals, and the calyx of four or five leaves; and the berry has many cells. There are four species, two of which are natives of Britain, viz. the lutea, or yellow water-lily; and the alba, or white water-lily.

NYMPHEUM, in antiquity, a public hall, magnificently decorated, for entertainment, &c. and where those who wanted convenience at home held their marriage-feasts, whence the name.

NYONS, a town of Dauphine, in France: E. long. 5° 6', N. lat. 44° 28'.

NYPSLOT, a town of Sweden in the province of Finland, sixty miles north of Wyburg: E. long. 29°, N. lat. 62°.

OAK

OAK, in botany. See Quercus.

OAK OF JERUSALEM, in botany. See Chenopodium.

OAKAM, old ropes untwisted, and pulled out into loose hemp, in order to be used in caulking the seams, tree-nails, and bends of a ship, for stopping or preventing leaks.

OAKHAMPTON, a borough of Devonshire, twenty

Vol. III. No 86. 2 miles west of Exeter, which sends two members to parliament.

OAR, in navigation, a long piece of wood, made round where it is to be held in the hand, and thin and broad at the other end, for the easier cutting and refiling the water, and consequently moving the vessel, by rowing. Oars for ships are generally cut out of fir-timber; those for barges are made out of New-England, or Dantzick-rafters.
OBELISK, in architecture, a truncated, quadrangular, column, in which the persons sworn invoke the Almighty to witness that their testimony is true; renouncing all claim to his mercy, and calling for his vengeance, if it be false.

OBADIAH, or the Prophecy of Obadiah, a canonical book of the Old Testament, which is contained in one single chapter; and is partly an invective against the cruelty of the Edomites, who mocked and derided the children of Israel, as they puffed into captivity, and with other enemies, their confederates, invaded and oppressed those strangers, and divided the spoil amongst themselves; and partly a prediction of the deliverance of Israel, and of the victory and triumph of the whole church over her enemies.

OBELISKS, in architecture, a truncated, quadrangular, and slender pyramid, raised as an ornament, and frequently charged either with inscriptions or hieroglyphics. Obelisks appear to be of very great antiquity, and to be first raised to transmit to posterity precepts of philosophy, which were cut in hieroglyphical characters: afterwards they were used to immortalize the great actions of heroes, and the memory of persons beloved. The first obelisk mentioned in history was that of Ramesses king of Egypt, in the time of the Trojan war, which was forty cubits high. Phitus, another king of Egypt, raised one of forty-five cubits; and Ptolemy Philadelphus, another of eighty-eight cubits, in memory of Arsinoe. Augustus erected one at Rome in the Campus Martius, which served to mark the hours on a horizontal dial, drawn on the pavement. They were called by the Egyptian priests the fingers of the sun, because they were made in Egypt also to serve as styles or gnomons to mark the hours on the ground. The Arabs still call them Pharaoth's needles: whence the Italians call them anguilla, and the French aiguilles.

OBERSTEIN, the capital of the county of the same name, in the Palatinate of the Rhine, thirty miles east of Triers.

OBERWESEL, or WESSEL, a town of Germany, in the electorate of Triers, thirty-seven miles north east of the city of Triers.

OBJECT, in philosophy, something apprehended, or presented to the mind, by sensation or by imagination. See Metaphysics.

OBJECT-GLASS of a telescope. See Optics.

OBJECTION, something urged to overthrow a position, or a difficulty raised against an allegation or proposition of a person we are disputing withal. OBJECTIVE is used, in the schools, in speaking of a thing which exists no otherwise than as an object known. The existence of such a thing is said to be objective.

OBLATI, in church history, were secular persons, who devoted themselves and their estates to some monastery, into which they were admitted as a kind of lay brothers. The form of their admission, was, putting the bell-rope of the church round their necks, as a mark of servitude. They wore a religious habit, but different from that of the monks.

OBLATION, a sacrifice, or offering made to God.

OBLIGATION, in Scots law. See Law Tit. xx.

OBLIQUE, in geometry, something slant, or that deviates from the perpendicular. Thus an oblique angle is either an acute or obtuse one, i.e. any angle except a right one.

OBLIQUE CASES, in grammar, are all the cases except the nominative.

OBLIQUE LINE, that which falling on another line, makes oblique angles with it, viz. one acute, and the other obtuse.

OBLIQUE PLANES, in dialling, are those which recline from the zenith, or incline towards the horizon. See Dialling.

OBLIQUE SAILING, in navigation. See Navigation.

OBLIQUITY of the ecliptic. See Astronomy.

OBLIQUUS, in anatomy, a name given to several muscles, particularly in the head, eyes, and abdomen. See Anatomy, Part II.

OBLONG, in general, denotes a figure that is longer than broad: such is a parallelogram, ellipsis, &c.

OBLUS, in antiquity, an ancient Athenian coin.

OBREPTIOUS, an appellation given to letters patent, or other instruments, obtained of a superior by surprize, or by concealing from him the truth.

OBSCURE, something that is dark and reflects little light, or that is not clear and intelligible.

OBSECRATION, in rhetoric, a figure whereby the orator implores the assistance of God, or man.

OBSEQUIES, the fame with funeral solemnities. See Funeral.

OBSEVATION, among navigators, signifies the taking of the sun's or the star's meridian altitude, in order thereby to find the latitude.

OBSEVATORY, a place designed for observing the heavenly bodies; being generally a building erected on some eminence, covered with a terrace for making astronomical observations.

The more celebrated observatories are, 1. The Greenwich observatory, built in 1676, by order of Charles II. at the solicitations of Sir Jonas Moor and Sir Christopher Wren; and furnished with the most accurate instruments, particularly a noble sextant of fifteen feet radius, with telescopic sights.

2. The parish-observatory, built by the late Louis XIV. in the Fauxbourg St. Jaques.

It is a very singular, but useful very magnificent building; the design of monsieur Pernaut: It is eighty feet high; and at top is a terras.

The difference in longitude between this and the Greenwich observatory is 2° 20' west.

In it is a cave, or cellar, 170 feet descent, for experiments that are to be made far from the sun, &c., particularly such as relate to congelations, refrigerations, inducements, confirmations, &c.

3. Tycho Brahe's observatory, which was in the little
OCCUPANT, in law, the person that first seizes, or gets possession of a thing.

OCCUPATION, in a legal sense, is taken for use or tenure; as in deeds it is frequently said, that such lands are or lately were in the tenure or occupation of such a person. It is likewise used for a trade or mystery.

OCCUPIERS of wapping, a term in the salt-works for the persons who are the sworn officers that allot in particular places what quantity of salt is to be made, that the markets may not be overstocked, and see that all is carried fairly and equally between the lord and the tenant.

OCEAN, in geography, that vast collection of salt and navigable waters, in which the two continents, the first including Europe, Asia, and Africa, and the last America, are inclosed like islands.

OCHLORACY, that form of government wherein the populace has the chief administration of affairs.

OCHNE, in botany, a genus of the polyandria monogynia class. The corolla consists of five petals, and the calyx of five leaves; and the berry contains one seed. There are two species, both natives of the Indies.

OCHRE, in natural history, a genus of earths, slightly coherent, and composed of fine, smooth, soft, argillaceous particles, rough to the touch, and readily diffusible in water.

Ochres are of various colours, as red, yellow, blue, brown, green, &c.

OCYNUM, in botany, a genus of the didynamia angiosperma class. The superior lip of the calyx is round, and the inferior is divided into four segments.

There are eight species, none of them natives of Britain.

OCKER, a river of Germany, which rises in Kalmuck Tartary, and forms the boundary between Europe and Asia, till it falls into the frozen ocean, after it has run a course of above two thousand miles.

OCCIDENT, in geography, the westward quarter of the horizon, or that part of the horizon where the ecliptic, or the sun therein, descends into the lower hemisphere, in contradiction to orient. Hence we use the word occidental, for any thing belonging to the west; as, occidental beard, occidental pearl, &c.

OCCIPITAL, in anatomy, a term applied to the parts of the occiput, or back part of the skull. See Anatomy.

OCCIPITIS os, the occipital bone, in anatomy. See Anatomy, p. 156.

OCCULT, something secret, hidden, or invisible. The occult sciences, are magic, necromancy, cabbala, &c.

Occult, in geometry, is used for a line that is scarcely perceivable, drawn with the point of the compasses, or a leaden pencil. These lines are used in several operations, as the raising of plans, designs of buildings, pieces of perspective, &c. They are to be effaced when the work is finished.

OCCULTATION, in astronomy, the time a star or planet is hid from our sight, by the interpolation of the body of the moon, or of some other planet. See Astronomy.

OCTAGON, or Octogon, in geometry, is a figure of eight sides and angles; and this, when all the sides and angles are equal, is called a regular octagon, or one which may be inscribed in a circle.

OCTAGON, in fortification, denotes a place that has eight bastions. See Fortification.

OCTAHEDRON, or Octaedron, in geometry, one of the five regular bodies, consisting of eight equal and equilateral triangles.

OCTANDRIA, in botany, one of the classes of plants. See Botany.

OCTANT, or Octile, in astronomy, that aspect of two planets, wherein they are distant an eighth part of a circle, or 45° from each other.

OCTAPLA, in matters of sacred literature, denotes a polyglot bible, consisting of eight columns, and as many different versions of the sacred text; viz, the original
ODE ( 410 )

ODE, in poetry, a song, or a composition proper to be sung.

Among the ancients, odes signified no more than songs; but with us they are very different things. The ancient odes were generally composed in honour of their gods, as many of those of Pindar and Horace. These had originally but one stanza, or strophe; but afterwards they were divided into three parts, the prosthöme, the antistrophe, and the epode: The priests going round the altar singing the praises of the gods, called the first entrance, when they turned to the left, the strophe; the second, turning to the right, they called antistrophe, or returning; and, lastly, standing before the altar, they sung the remainder, which they called the epode.

Heroes and triumphs were also subjects for the odes; and in course of time love and entertainments were likewise thought very suitable to it. Here Anacreon and Sappho excelled, and Horace has left us some of both sorts with peculiar sweetness and elegance. Among the moderns, Dryden's ode on St Cecilia's day, and Pope's on the same subject, are justly allowed to exceed every thing of the kind, either in this, or in any of the modern languages.

ODENSEE, the capital of Funen, one of the largest of the Danish islands in the Baltic, situated forty-two miles west of Copenhagen.

ODER, a river which rises in the Carpathian mountains, on the confines of Hungary; runs through Silesia and Brandenburg; and then separating the eastern from the western Pomerania, divides itself into several channels, and falls into the Baltic sea.

ODYSSIE, a celebrated epic poem of Homer, wherein are related the adventures of Ulysses in his return from the siege of Troy.

OECONOMICS, the art of managing the affairs of a family, or community; and hence the person who takes care of the revenues and other affairs of churches, monasteries, and the like, is termed oeconomus.

OECONOMY, denotes the prudent conduct, or discreet and frugal management, whether of a man's own estate, or that of another.

Animal OECONOMY, comprehends the various operations of...
of nature, in the generation, nutrition, and preservation of animals. See Generation, Nutrition, &c.

The doctrine of the animal economy is nearly connected with physiology, which explains the several parts of the human body, their structure, use, &c. See Anatomy.

OECUMENICAL, signifies the same with general, or universal; as oecumenical council, bishop, &c.

OEDEMA, in medicine and surgery. See Medicine and Surgery.

OEDENBURG, or Edenburg, a town of Hungary, thirty miles south of Vienna.

OELFELD, a town in the duchy of Magdeburg and circle of Lower Saxony in Germany, twenty miles east of Brunswick.

OENANTHE, in botany, a genus of the pentandria digynia class. The flowers are sessile, diffimular, and barren in the disk; and the fruit is crowned with a calyx. There are five species, three of them natives of Britain, viz. the bifulosa, or water-dropwort; the pimpinelloides, or pimpernel-dropwort; and the crocata, or yellow dropwort.

OENANTHE, in ornithology, a species of motacilla. See Motacilla.

OENAS. See Columba.

OENOPTAE, in Grecian antiquity, a kind of censors at Athens, who regulated entertainments, and took care that none drank too much or too little.

OENOTHERA, in botany, a genus of the oenanthia monogynia class. The calyx consists of four segments, and the corolla of four petals; the capsule is cylindrical, and the seeds are naked. There are seven species, none of them natives of Britain.

OESEL, an island at the entrance of the bay of Livonia, in the Baltic sea; situated in 22° 3' and N. lat. 48° 3'.

OESELD, a town in the duchy of Magdeburg and circle of Lower Saxony in Germany, twenty miles east of Brunswick.

OESELD, a town in the duchy of Magdeburg and circle of Lower Saxony in Germany, twenty miles east of Brunswick.

OESOPHAGUS, in anatomy. See Anatomy, p. 292.

OESTRUS, in zoology, a genus of insects belonging to the order of diptera. It has no mouth, but the point appears in place of it, without any probosces or snout. There are five species, distinguished by their colour.

OETING, the capital of the county of the same name, in the circle of Swabia, in Germany: E. long. 10° 25', and N. lat. 49'.

OFFENBURG, a free imperial city of the circle of Swabia, in Germany, situated on the river Kintzig: E. long. 7° 40', and N. lat. 48° 20'.

OFFENCE in law, an act committed against the law, or omitted where the law requires it.

OFFICE, a particular charge or trust, or a dignity attended with a public function. The word is primarily used in speaking of the offices of judicature and policy; as the office of a secretary of state, the office of a sheriff, of a justice of peace, &c.

OFFICE also signifies a place or apartment appointed for officers to attend in, in order to discharge their respective duties and employments: as the secretary's office, office of ordnance, excise-office, signet-office, paper-office, pipe-office, six-clerks office, &c.

OFFICE, in architecture, denotes all the apartments appointed for the necessary occasions of a palace or great house, as kitchens, pantries, confectionaries, &c.

OFFICE, in the canon-law, is used for a benefice that has no jurisdiction annexed to it.

OFFICER, a person possesséd of a post or office. See the preceding article.

Commission-OFFICERS are those appointed by the king's commission: such are all from the general to the cornet inclusive, who are thus denominated in contradistinction to warrant-officers, who are appointed by the colonel's or captain's warrant, as quarter-masters, sergeants, corporals, and even chaplains and surgeons.

Field OFFICERS are such as command a whole regiment, as the colonel, lieutenant-colonel, and major.

Flag OFFICERS. See Flag-officers, and Admiral.

General OFFICERS are those whose whole command is not limited to a single company, troop, or regiment; but extends to a body of forces, composed of several regiments; such are the general, lieutenant-general, major-general, and brigadiers.

OFFICERS of the house hold. See Household.

Staff-OFFICERS are such as, in the king's presence, bear a white staff, or wand; and at other times, on their going abroad, have it carried before them by a footman bare-headed: such are the lord steward, lord chamberlain, lord treasurer, &c.

The white staff is taken for a commission, and at the king's death each of these officers breaks his staff over the hearfe made for the king's body, and by this means lays down his commission, and discharges all his inferior officers.

Subaltern-OFFICERS are all who administer justice in the name of subjects; as those who act under the earl marshal, admiral, &c. In the army, the subaltern officers are the lieutenants, cornets, ensigns, sergeants, and corporals.

OFFICIAL, in the canon-law, an ecclesiastical judge, appointed by a bishop, chapter, abbot, &c. with charge of the spiritual jurisdiction of the diocese.

OFFICIAL, is also a deputy appointed by an archdeacon, as his assistant, who sits as judge in the archdeacon's court.

OFFICIAL, in pharmacy, an appellation given to such medicines, whether simple or compound, as are required to be constantly kept in the apothecaries' shops.

OFFIDA, a town of Italy subject to the pope, twenty-six miles south of Loretto.

OFFING, or Offin, in the sea language, that part of the sea a good distance from shore, where there is deep water, and no need of a pilot to conduct the ship: thus, if a ship from shore be seen falling out to seaward, they say, the stands for the offing: and if a ship having the shore near her, have another a good way without her, or towards the sea, they say, that ship is in the offing.

OFF-SETS, in gardening, are the young shoots, that spring.
spring from the roots of plants; which being carefully separated, and planted in a proper soil, serve to propagate the species.

Off sets, in surveying, are perpendiculars let fall, and measuring from the stationary lines to the hedge, fence, or extremity of an enclosure.

OGEE, or O. G. in architecture, a moulding consisting of two members, the one concave, and the other convex; or of a round and a hollow, like an S. See Architecture.

OGIVE, in architecture, an arch, or branch of a gothic vault; which, instead of being circular, passes diagonally from one angle to another, and forms a cross with the other arches.

OGLIO, a river which rises in the Alps, in the county of Verona, enters the Adriatic Sea, and is navigable eighty miles.

OHIO, a large river of North America, which, taking its rise in the mountains of Pennsylvania, runs south-west; and, after receiving many considerable branches, falls into the Mississippi.

OSIANS, a town of France, in the province of Dauphine, fifteen miles south-east of Grenoble.

OLDENBURG, the capital of the county of the same name in Westphalia: E. long. 7° 32', and N. lat. 52° 35'.

OLDENDORP, a town of Germany in the circle of Hanover.

OLDENLANDIA, a genus of the tetrandria monogynia class. The corolla consists of four leaves, and the calyx of four segments; and the capsule has two cells, and many seeds. There are four species, none of them natives of Britain.

OLDENZEL, a city of the United Netherlands, in the province of Overijssel: E. long. 6° 50', and N. lat. 52° 20'.

OLD-DIFFUSIA. See Balistes.

OLEA, in botany, a genus of the diandria monogynia class. The corolla has four segments, with oval lanceae; and the drupa contains one seed. There are two species.

This tree grows in the southern parts of France, in Spain, Italy, and other warm countries; with us it is usually preferved in the green-houses of the curious; though it will bear our ordinary winters in the open air, and produce very good fruit. Olives have an acrid, bitter, extremely disagreeable taste; pickled (as we receive them from abroad) they prove less disagreeable. The Lucca olives, which are smaller than the others, have the weakest taste; the Spanish, or larger, the strongest; the Provence, which are of a middling size, are generally the most esteemed.

The oil obtained from this fruit has no particular taste or smell; and does not greatly differ in quality from oil of almonds. Authors make mention of two sorts of this oil, one expressed from the olives when fully ripe, which is our common oil olive; the other, before it has grown ripe; this is called oleum immaturo, and omphacium. Nothing is met with in the shops under this name; and Lemery affirms, that there is no such oil, unripe olives yielding only a nauseous juice to the press. From the ripe fruit, two or three sorts are obtained, differing in degree of purity; the purest runs by light pressure; the remaining magmatic, heated and pressed more strongly, yields an inferior sort, with some dregs at the bottom, called amures. All these oils contain a considerable portion of aqueous moisture, and a mucilaginous substance; which subject them to run into a putrid state; to prevent this, the preparers add some sea salt, which imbibing the aqueous and mucilaginous parts, sinks with them to the bottom; by this means the oil becomes more homogene, and consequently less susceptible of alteration. In its passage to us, some of the salt, thrown up from the bottom by the shaking of the vessel, is sometimes mixed with and detained in the oil, which, in our colder climate, becomes too thick to suffer it freely to subside; and hence the oil is sometimes met with of a manifestly fatty tinge. Olive-oil is used in the simple balsam of sulphur, Locatelli's balsam, and several ointments. It is oftener employed in this last intention than the other expressed oils, but more rarely for internal medicinal purposes.

OLEAGINOUS, something that partakes of the nature of oil, or out of which oil may be expressed.

OLECRANUM, or Olecranon, in anatomy. See Anatomy, p. 178.

OLERON, an island of France, near the coast of Poitou, fourteen miles south-west of Rochelle, being about fifteen miles long, and six broad.

Sea-laws of Oleron, certain laws relating to maritime affairs, made in the time of Rich. I. when he was at the island Oleron.

These laws, being accounted the most excellent sea-laws in the world, are recorded in the black book of the admiralty.

OLESCO, a town of upper Volhina, in Poland: east longitude 24°, and north latitude 50°.

OLFATORY nerves. See Anatomy, p. 248.

OLIBANUM, Frankincense, in pharmacy, a dry resinous substance, brought to us in detached pieces, or drops as it were, like those of mastic; but larger, and of a less pure and pellucid texture.

It is of a pale yellowish white colour, but with some mixture of a brownish cast in it. It is moderately heavy; its smell is strong, but not disagreeable; and its taste bitter, acrid, and resinous.

Olibanum is to be chosen white, pure, dry, and as much approaching to pellucidity as may be.

Olibanum is greatly commended by many against disorders of the head and breast, and against diarrhœas and
and dysenteries, and profusia of the menes, and the fever albus. Its doe is from ten grains to a drachm. It is esteemed by many a specific in pleurises, especially when epidemic.

Externally it is used in fumigations for disorders of the head, and against catarrhs; and is an ingredient in some plasters. It is a noble balsam in confumptions, given in substancce, or dissolved with the yolk of an egg into the form of an emulsion. There is an oil made of it per deliquium, in the same manner as that of myrrh: this is done by putting the powder of it in the white of a boiled egg, in a cellar, till it runs into a liquor; this is esteemed a great cosmetic, and destroyer of pimples in the face.

OLIGAEDRA, in natural history, the name of a genus of crystals, and expresses that which is composed of only a few planes.

The bodies of this class are crystals of the imperfect kind, being composed of columns affixed irregularly to some solid body at one end, and the other terminated by a pyramid; but the column and pyramid being both pentangular, the whole consists only of ten planes, and not, as the common kind, of twelve.

OLIARCHY, a form of government, wherein the administration of affairs is lodged in the hands of a few persons.

OLINDA, a city and port-town of Brazil: west long. 35°, and south lat. 8°.

OLIO, in cookery, denotes a favoury dish composed of a great variety of ingredients, chiefly used by the Spaniards.

OLIVA, a port-town of Poland, in the province of regal Prussia, only six miles west of Dantzick.

OLIVARYA corpora, in anatomy. See Anatomy, p. 287.

OLIVE, in botany. See Olea.

Olive-colour, a yellow mingled with black. See Optics.

OLIVENZA, a town of Alentejo, in Portugal, ten miles south of Elvas.

OLMUTS, a city of Moravia, seventy-five miles north of Vienna.

OLYMPIA, a port-town of the Morea, at present called Longinico: east long. 21° 35', and north lat. 37° 40'.

OLYMPIAD, the space or period of four years, whereby the Greeks reckoned time. See Astronomy, p. 493.

OLYMPIC GAMES were solemn games, famous among the ancient Greeks, so called from Olympian Jupiter, to whom they were dedicated; and by some said to be first instituted by Jupiter, after his victory over the sons of Titan; others ascribe their institution to Hercules, not the son of Alcmena, but one of much greater antiquity; others, to Pelops; and others, to Hercules the son of Alcmena. These games were so considerable, that the Greeks made them their epocha, distinguishing their years by the return of the olympics.

The care and management of these games belonged, for the most part, to the Eleans, who, on that account, enjoyed their possessions without molestation, or fear of war or violence. They appointed a certain number of judges, who were to take care that those who offered themselves as competitors performed their preparatory exercises; and those judges, during the solemnity, fat naked, having before them a crown of victory, formed of wild-olive, which was presented to whomsoever they adjudged it. Those who were conquerors, were called Olympionices, and were loaded with honours by their countrymen. At these games women were not allowed to be present; and if any woman was found to have passed the river Alpheus, during the solemnity, she was to be thrown headlong from a rock.

OLYMPUS, the name of two mountains, the one in Bythinia in the Lesser Asia, and the other in the island of Cyprus.

OMAN, a province or kingdom in the south-east parts of Arabia Felix.

OMBRE, a celebrated game at cards, borrowed from the Spaniards, and played by two, by three, or by five persons, but generally by three.

OMBRE DE SOLEIL, Shadow of the sun, in heraldry, is when the sun is borne in armory, so as that the eyes, nose, and mouth, which at other times are represented, do not appear; and the colouring is thin, so that the field can appear through it.

OMBRIA, the ancient name of a province of Italy, in the territory of the pope, now called Spoletto and Perugia.

OMIRO, or LOMBO, a town of Italy, in the duchy of Tuscany, and territory of the Siennois, situated near the Tufcan sea, a little south of the lake of Castiglione, forty-five miles south-west of Sienna.

OMELET, or AMLET, a kind of pancake or fricaffee of eggs, with other ingredients, very usual in Spain and France.

OMEN, a certain accident and casual occurrence that was thought to presage either good or evil. There were three sorts of omens among the ancients. One was of things internal, or those which affected the persons themselves; the second, of things external, that only appeared to men, but did not make any impression on them; the third were ominous words. Of the first sort were those sudden conterations, called panic fears, that seized upon men without any visible cause, and were therefore imputed to the demons, especially the god Pan: of these panics there is frequent mention in history. The second sort of omens were of such things as appeared to men, but were not contained in their own bodies. Of these there were several sorts: the beginning of things were thought to contain something ominous: it was thought a direful omen, when any thing unusual befel the temples, altars, or statues of the gods. Under the head of external omens are to be placed those which offered themselves in the way; such were the meeting of an eunuch, a black, a bitch with whelps, a snake lying in the road, &c. Words were ominous; and as they were good or bad, were believed to presage accordingly.

OMENTUM, in anatomy. See Anatomy, p. 266.
OMERS, or St. Omer’s, a city of Artois, in the French Netherlands, twenty miles south of Dunkirk, and eighteen fourth-sail of Calais.

OMILANDS, a division of the province of Groningen, in the United Provinces.

OMMEN, a town of the United Netherlands, in the province of Overijssel, situated on the Ij river, seventeen miles north-east of Deventer.

OMOPHAGIA, an ancient Greek festival, in honour of Bacchus, surnamed Omophagos, i.e. eater of raw flesh. This festival was observed in the same manner with the other festivals of Bacchus, in which they counterfeited raw and bloody, in imitation of the god, who was supposed to do the same thing.

OMPLATE, in anatomy. See Anatomy, p. 176.

OMPHALO-MESENTERIC, in anatomy. All fetuses are wrapped up in at least two coats or membranes; most of them have a third, called allantois, or urinary.

Some, as the dog, cat, hare, &c. have a fourth, which has two blood-vessels, viz. a vein and an artery, called omphalo-mesenteric, because passing along the firing to the navel, and terminating in the mesentery.

ONANDAGOES, one of the tribes of the Iroquois, or Five Nations, situated on the lake Ontario, or Frontenac, in North America: they are allies of Great Britain.

ONANIA, or Onanism, terms which some late empirics have framed, to denote the crime of self-pollution, mentioned in scripture to have been practised by Onan, and punished in him with death.

ONEGA-LAKE, a lake upwards of an hundred miles long, and forty broad, situated in the empire of Russia between 61° and 63° of north lat. and 35° east longitude.

ONEGLIA, a port town of Italy, seventy miles south-west of Genoa, subject to the king of Sardinia: it is long 8° 30', and north lat. 44°.

ONEIROCRITICA, the art of interpreting dreams, or predicting future events from dreams.

ONGAR, a market town of Essex, ten miles west of Chelmsford.

ONGLÉ’E, in heraldry, an appellation given to the talons or claws of beasts or birds, when borne of a different colour from that of the body of the animal.

ONION. See Cepa.

ONISCUS, in zoology, a genus of insects, belonging to the order of aptera. It has 14 feet, bristly feelers, and an oval body. There are 17 species.

ONKOTOMY, in surgery, the operation of opening a tumour or abscess. See Surgery.

ONOCLEA, in botany, a genus of the cryptogamia, the fruit consists of several globular capsules, with five valves and one cell, in which are several tiny hairy seeds.

ONOCROTALUS, in ornithology. See Pelicanus.

ONOMANCY, a branch of divination, which foretells the good or bad fortune of a man, from the letters in his name.

From much the same principle the young Romans toasted their miltreaves as often as there were letters in their names: hence Martial says,

Novia sex cyathis, septem jujina bibatur.

ONOMATOPOEIA, in grammar and rhetoric, a figure where words are formed to resemble the sounds made by the things signified; as the buzz of bees, the cackling of hens, &c.

ONONIS, in botany, a genus of the diadelphie decandria class. The calyx has five segments; the vexillum is divided; and the pod is sepal and turgid. There are 19 species, three of them natives of Britain, viz. the spinoa, or reft-harrow; the arvenfis, or corn reft-harrow; and the repens, or creeping reft-harrow.

ONOPORDUM, a genus of the syngenesia polygama equalis class. The receptacle is naked, and the seeds of their calyx are sharp-pointed. There are four species, none of them natives of Britain.

ONTARIO, or Frontenac, a lake of North America: situated in W. long. 79°, and between 41° and 43° N. lat.

ONTOGY. See Metaphysics.

ONYX, in natural history, one of the semi-pellucid gems, with variously coloured zones, but none red; being composed of crystal, debased by a small admixture of earth; and made up either of a number of flat plates, or of a series of coats surrounding a central nucleus, and separated from each other by veins of a different colour, resembling zones or belts.

We have four species of this gem. 1. A bluish white one, with broad white zones. 2. A very pure onyx, with snow-white veins. 3. The jasperonyx, or boronyx, with green zones. 4. The brown onyx, with bluish white zones.

OOST, a kiln for drying hops after they are picked from the stalks.

OOSTERGO, the north division of West Friesland, one of the United Provinces.

OPACITY, in philosophy, a quality of bodies which renders them impervious to the rays of light. See Optics.

OPAL, in natural history, a species of gems.

The opal is a gem of a peculiar kind, and has been esteemed by many in all ages of very great value; though at present it is of less value, in proportion to its size, than any of the finer gems. It is softer than any other of the fine gems, and is difficult to polish to any degree of nicety. It is found of various shapes and sizes: its most frequent bignesses is between that of a pea and a horse-bean; but it is found as small as the head of a large pin, and has been seen of the size of a large walnut. Its figure is very various and uncertain, but it is never found in a crystalliform or columnar state; its most usual shape is an irregularly oblong one, convex above, flattened at bottom, and dented with various sinuosities at its sides. It is often found among the loofe earth of mountains, sometimes on the shores of rivers, and not unfrequently bedded in the coalier kinds of jasper.
OPHIDES, in church history, Christian heretics, so called both from the veneration they had for the serpent that tempted Eve, and the worship they paid to a real serpent.

OPHYXYS, in botany, a genus of the gynandria diandra class. The nektarium has a kind of carina on the under part. There are 18 species, eleven of which are natives of Britain.

OPHTHALMIA, in medicine, an inflammation of the membranes which invest the eye; especially of the adnata, or albugineous coat. See Medicine.

OPHTHALMIC NERVES. See Anatomy, p. 248.

OPHTHALMOSCOPY, a branch of physiognomy, which deduces the knowledge of a man's temper and manners from the appearance of his eyes.

OPiates, medicines of a thicker consistence than a syrup, prepared with opium scarcely fluid. They consist of various ingredients, made up with honey or syrup; and are to be used for a long time either for purgative, alternative, or corroborative intentions.

The word opiate is also used, in general, for any medicine given with an intention to procure sleep, whether in the form of electuaries, drops, or pills.

OPINION, is defined to be an assent of the mind to propositions not evidently true at first sight.

OPISTHOTONOS, in medicine, a kind of convulsion, wherein the body is bent backwards.

OPium, in the materia medica, is an inspissated juice, partly of the resinous, and partly of the gummy kind, brought to us in cakes from eight ounces to a pound weight. It is very heavy, of a dense texture, and not perfectly dry; but, in general, easily receives an impression from the finger: its colour is a brownish yellow, so very dark and dully that at first it appears black: it has a dead and faint smell, and its taste is very bitter and acrid. It is to be chosen moderately firm, and not too soft; its smell and taste should be very strong, and care is to be taken that there is no dirty or flaty matter in it.

Opium is the juice of the poppy album, or white poppy, with which the fields of Asia Minor are in many places sown, as ours are with corn. When the heads are near ripening, they wound them with an instrument that has five edges, which, on being stuck into the head makes at once five long cuts in it; and from these wounds the opium flows, and is next day taken off by a person who goes round the field, and puts it in a vessel which he carries fastened to his girdle; at the same time that this opium is collected, the opposite side of the poppy head is wounded, and the opium collected from it the next day. They distinguish, however, the produce of the first wounds from that of the succeeding ones; for the first juice afforded by the plant is greatly inferior to what is obtained afterwards. After they have collected the opium, they moisten it with a small quantity of water or honey, and work it long time upon a flat, hard, and smooth board, with a thick and strong instrument of the same wood, till it becomes of the consistence of pitch; and then work it up with their hands, and form it into cakes or rolls for sale.
Optics is in great esteem, and is one of the most valuable of all the simple medicines. Applied externally, it is emollient, relaxing, and diffusient, and greatly promotes suppuration: if long kept, upon the skin, it takes off the hair, and always occasions an itching in it; sometimes it exacerbates it, and raises little blisters, if applied to a tender part: sometimes, on external application, it allays pain, and even occasions sleep: but it must by no means be applied to the head, especially to the futures of the skull; for it has been known to have the most terrible effects in this application, and even to bring on death itself. Opium, taken internally removes melancholy, eases pain, and diffuses to sleep; in many cases removes hæmorrhages, provokes sweating. A moderate dose is commonly under a grain; though, according to the circumstances, two grains, or even three, may be within the limits of this denomination: but custom will make people bear a dram or more; though in this case nature is vitiates, and nothing is to be hence judged in regard to others. If given dissolved, it operates in half an hour; if in a solid form, as in pills, or the like, it is sometimes an hour and a half. Its first effect, in this case, is making the patient cheerful, as if he had drank moderately of wine, and at the same time bold and above the fear of danger; for which reason the Turks always take it when they are going to battle. A very immediate of opium brings on a fort of drunkenness, much like that occasioned by an immaterial quantity of strong liquors; cheerfulness and loud laughter at first, than a relaxation of the limbs, a loss of memory, and lightheadedness; then vertigo, dimness of the eyes, with a laxity of the corners and a dilatation of the pupils, a slowness of the pulse, redness of the face, relaxation of the under jaws, swelling of the lips, difficulty of breathing, painful erection of the penis, convulsions, cold sweats, and finally death. Those who escape are usually relieved by a great number of floors, or profuse sweats.

Prepared opium, commonly called extract of opium, is made by dissolving opium in a sufficient quantity of water with a gentle heat; then straining the solution from the faces, and evaporating it to the consistence of honey. Tincture of opium, or liquid laudanum, otherwise called the thebais tincture, is made as follows: Take of prepared opium, two ounces; of cinnamon and cloves, each one drachm; of white-wine, one pint; infuse them a week without heat, and then filter it through paper.

OPOCULAMUM, in the materia medica. See Bal-sam.

OPOXANAX, in the materia medica, is a gum resin of a tolerably firm texture, usually brought to us in loofe granules or drops, and sometimes in large masses, formed of a number of these connected by a quantity of matter of the same kind; but these are usually loaded with extraneous matter, and are greatly inferior to the pure loose kind. The drops or granules of the fine opopanax, are on the outside of a brownish red colour, and of a dusky yellowish or whisth colour within: they are of a somewhat mucuous appearance, smooth on the surface; and are to be chosen in clear pieces, of a strong smell and acid taste.

Opoppanax is attenuating and diffusient, and is gently purgative; it diffuses flatulencies, and is good in asthma, in inveterate coughs, and in disorders of the hand and nerves. It also promotes the menstrual, and is good against all obstructions of the viscer.

OPOSSUM, in zoology. See Didelphis.

OPPILATION, in medicine, the act of obstructing or stopping up the passageways of the body, by redundant or peccant humours. This word is chiefly used for obstructions in the lower belly.

OPPONENT, a person who withstands or opposes another.

OPPOSITION, in logic, the disagreement between propositions which have the same subject and the same predicate.

OPTATIVE mood, in grammar, that which serves to express an ardent desire or wish for something.

In most languages, except the Greek, the optative is only expressed by prefixing to the subjunctive an adverb of willing; as utinam, in Latin; plus a Dieu, in French; and would to God, in English.

OPTERIA, in antiquity, presents made by a bridegroom to his bride, when first conducted to him.
great, appears from the light of a candle; which, if there be no obstacle in the way to obstruct the passage of its rays, will fill all the space within two miles of the candle every way with luminous particles, before it has lost the least sensible part of its substance.

A ray of light is a continued stream of these particles, flowing from any visible body in a straight line, and those particles themselves are incomprehensible small, is manifest from the following experiment. Make a small pin-hole in a piece of black paper, and hold the paper upright on a table facing a row of candles shining by one another; then place a sheet of paleboard at a little distance behind the paper, and some of the rays which flow from all the candles through the hole in the paper, will form as many specks of light on the paleboard, as there are candles on the table before the plate; each speck being as distinct and clear, as if there was only one speck from one single candle; which shows, that the particles of light are exceedingly small, otherwise they could not pass through the hole from so many different candles without confusion.—Dr. Newenham has computed, that there flows more than 6,000,000,000,000 times as many particles of light from a candle in one second of time, as there are grains of sand in the whole earth, supposing each cubic inch of it to contain 1,000,000.

These particles, by falling directly upon our eyes, excite in our minds the idea of light. And when they fall upon our bodies, and are thereby reflected to our eyes, they excite in us the ideas of these bodies. And as every point of a visible body reflects the rays of light in all manner of directions, every point will be visible in every part to which the light is reflected from it. Thus the object ABC (Optical Plates, fig. 11.) is visible to an eye in any part where the rays Ac, Ab, Ac, Ad, Ae, Ba, Bb, Be, Bd, Be, and Ca, Cb, Ce, Cd, Ce, come. Here we have shown the rays as if they were only reflected from the ends A and B, and from the middle point C of the object; every other point being supposed to reflect rays in the same manner. So that, wherever a spectator is placed with regard to the body, every point of that part of the surface which is towards him will be visible, when no intervening object stops the passage of the light.

Since no object can be seen through the bore of a bented pipe, it is evident that the rays of light move in straight lines, whilst there is nothing to refract or turn them out of their rectilinear course.

Whilst the rays of light continue in any medium of an uniform density, they are straight; but when they pass obliquely out of one medium into another which is either more dense or more rare, they are refracted towards the denser medium: and this refraction is more or less, as the rays fall more or less obliquely on the refracting surface which divides the mediums.

To prove this by experiment, let the empty vessel ABCD (No. 2.) into any place where the sun shines obliquely, and observe the part where the shadow of the edge BC falls on the bottom of the vessel at E; then fill the vessel with water, and the shadow will reach no farther than F; which shows, that the ray aBE, which came straight in the open air, just over the edge of the vessel at B to its bottom at E, is refracted by falling obliquely on the surface of the water at B; and instead of going on in the rectilinear direction aBE, it is bent downward in the water from B to e, the whole bend being at the surface of the water: and so of all other rays abc.

If a stick be laid over the vessel, and the sun's rays be reflected from a glass perpendicularly into the vessel, the shadow of the stick will fall upon the same part of the bottom, whether the vessel be empty or full; which shows that the rays of light are not refracted when they fall perpendicularly on the surface of any medium.

The rays of light are as much refracted by passing out of water into air, as by passing out of air into water. Thus, if a ray of light flows from the point e, under water, in the direction eB; when it comes to the surface of the water at B, it will not go on thence in the rectilinear course Bd, but will be refracted into the line Ba. Therefore,

To an eye at e looking through a plane glass in the bottom of the empty vessel, the point a cannot be seen, because the side Be of the vessel interposes; and the point d will just be seen over the edge of the vessel at B. But if the vessel be filled with water, the point a will be seen from e; and will appear as at a, elevated in the direction of the ray eA. Hence a piece of money lying at e, in the bottom of an empty vessel, cannot be seen by an eye at a, because the edge of the vessel intervenes; but let the vessel be filled with water, and the ray ea being then refracted at B, will strike the eye at a, and so render the money visible, which will appear as if it were raised up to / in the line abc.

The time of sun-rising or setting, supposing its rays suffered no refraction, is easily found by calculation. But observation proves, that the sun rises sooner and sets later every day than the calculated time; the reason of which is plain, from what was said immediately above. For, though the sun's rays do not come part of the way to us through water, yet they do through the air or atmosphere, which being a grofer medium than the free space between the sun and the top of the atmosphere, the rays, by entering obliquely into the atmosphere, are there refracted, and thence bent down to the earth. And although there are many places of the earth to which the sun is vertical at noon, and consequently his rays can suffer no refraction at that time, because they come perpendicularly through the atmosphere; yet there is no place to which the sun's rays do not fall obliquely on the top of the atmosphere, at his rising and setting; and consequently, no clear day in which the sun will not be visible before he rises in the horizon, and after he sets in it; and the longer or shorter, as the atmosphere is more or less replete with vapours. For, let ABC (No. 3.) be part of the earth's surface, DEF the atmosphere that covers it, and EBGH the sensible horizon of an observer at B. As every point of the sun's surface sends out rays of light in all manner of directions, some of his rays will constantly fall upon, and enlighten, some half of our atmosphere; and

* Any thing through which the rays of light can pass, is called a medium; as air, water, glass, diamond, or even vacuum.
and therefore, when the sun is at \( I \), below the horizon \( H \),
thee rays which go on in the free space \( I K \) preserve a rectilinear course until they fall upon the top of the atmosphere; and those which fall so about \( K \), are refracted at their entrance into the atmosphere, and bent down in the line \( KmK \), above the horizon \( BGH \), when he is really below it at \( I \).

The angle contained between a ray of light, and a perpendicular to the refracting surface, is called the angle of incidence; and the angle contained between the same perpendicular, and the same ray after refraction, is called the angle of refraction. Thus (No. 4.) let \( LBM \) be the refracting surface of a medium (suppose water,) and \( ABC \) a perpendicular to that surface; let \( DB \) be a ray of light, going out of air into water at \( B \), and therein refracted in the line \( BH \); the angle \( ABD \), is the angle of incidence, of which \( DF \) is the line; and the angle \( KBH \) is the angle of refraction, whose sine is \( KI \).

When the refracting medium is water, the sine of the angle of incidence is to the sine of the angle of refraction as 4 to 3; which is confirmed by the following experiment, taken from Doctor Smith’s Optics.

Describe the circle \( DABC \) on a plane square board, and crofs it at right angles with the straight lines \( ABC \), and \( LBM \); then, from the intersection \( A \), with any opening of the compasses, let off the equal arcs \( AD \) and \( AE \), and draw the right line \( DEF \); then, taking \( Fa \), which is three quarters of the length \( FE \), from the point \( a \), draw \( ai \) parallel to \( ABK \), and join \( KI \) parallel to \( BM \): so \( KI \) will be equal to three quarters of \( FE \) or of \( DF \). This done, fix the board upright upon the leaden pedestal \( O \), and stick three pins perpendicularly into the board, at the points \( D \), \( B \), and \( I \); then set the board upright into the vessel \( TUV \), and fill up the vessel with water to the line \( LBM \). When the water has settled, look along the line \( DB \), so as you may see the head of the pin \( B \) over the head of the pin \( D \); and the pin \( I \) will appear in the same right line produced to \( G \), for its head will be seen just over the head of the pin at \( B \); which shews that the ray \( IB \), coming from the pin at \( I \), is so refracted at \( B \), as to proceed from thence in the line \( BD \) to the eye of the observer; the same as it would do from any point \( G \) in the right line \( DFG \), if there were no water in the vessel: and also shews, that \( KI \), the line of refraction in water, is to \( DF \), the line of incidence in air, as 3 to 4.

Hence, if \( DBH \) were a crooked stick put obliquely into the water, it would appear a straight one at \( DBC \). Therefore, as the line \( BH \) appears at \( BG \), so the line \( BC \) will appear at \( BG \): and consequently, a straight stick \( DBG \) put obliquely into water, will seem bent at the surface of the water in \( B \), and crooked, as \( DBC \).

When a ray of light passes out of air into glasses, the sine of incidence is to the sine of refraction as 3 to 2; and when out of air into a diamond, as 5 to 2.

Of Glasses.

Glass may be ground into eight different shapes at \( LBM \), for optical purposes, viz.

1. A plane glass, (No. 5,) which is flat on both sides, and of equal thickness in all parts, as \( A \).
2. A plano-convex, which is flat on one side, and convex on the other, as \( B \).
3. A double-convex, which is convex on both sides, as \( C \).
4. A plano-concave, which is flat on one side, and concave on the other, as \( D \).
5. A double concave, which is concave on both sides, as \( E \).
6. A meniscus, which is concave on one side, and convex on the other, as \( F \).
7. A flat plano-convex, whose convex side is ground into several little flat surfaces, as \( G \).
8. A prism, which has three flat sides; and when viewed endwise, appears like an equilateral triangle, as \( H \).

Glasses ground into any of the shapes \( B, C, D, E, F \), are generally called lenses.

A right line \( LIK \), (No. 6.) going perpendicularly through the middle of a lens, is called the axis of the lens.

A ray of light \( Gh \), falling perpendicularly on a plane glass \( EF \), will pass through the glass in the same direction \( hi \), and go out of it into the air in the same right course \( HF \).

A ray of light \( AB \), falling obliquely on a plane glass, will go out of the glass in the same direction, but not in the same right line: for in touching the glass, it will be refracted in the line \( BC \); and in leaving the glass, it will be refracted in the line \( CD \).

A ray of light \( CD \), (No. 7.) falling obliquely on the middle of a convex glass, will go forward in the same direction \( DE \), as if it had fallen with the same degree of obliquity on a plane glass; and will go out of the glass in the same direction with which it entered; for it will be equally refracted at the points \( D \) and \( E \), as if it had passed through a plane surface. But the rays \( CG \) and \( CF \) will be so refracted, as to meet again at the point \( F \). Therefore, all the rays which flow from the point \( C \), so as to go through the glass, will meet again at \( F \); and if they go farther onward, as to \( L \), they crofs at \( F \), and go forward on the opposite sides of the middle ray \( CDEF \), to what they were in approaching it in the directions \( HF \) and \( KF \).

When parallel rays, as \( ABC \), (No. 8.) fall directly upon a plano-convex glass \( DE \), and pass through it, they will be so refracted, as to unite in a point \( f \) behind it; and this point is called the principal focus; the distance of which, from the middle of the glass, is called the focal distance, which is equal to twice the radius of the sphere of the glass’s convexity. And,

When parallel rays, as \( ABC \), (No. 9.) fall directly upon a glass \( DE \), which is equally convex on both sides, and passes through it; they will be so refracted, as to meet in a point or principal focus \( f \); whose distance is equal to the radius or semidiameter of the sphere of the glass’s convexity. But if a glass be more convex on one side than on the other, the rule for finding the focal distance is this: As the sum of the semidiameters of both convexities is to the semidiameter of either, so is double the semidiameter.
OPTICS.

If another glass FG, of the same convexity as DE, be placed in the rays at the same distance from the focus, it will refract them so, as that, after going out of it, they will be all parallel, as abc; and go on in the same manner FG, as they converged in the space DFE in coming to it.

If another glass FG of the same convexity as DE, be placed in the rays at the same distance from the focus, it will refract them so, as that, after going out of it, they will be all parallel, as abc; and go on in the same manner FG, as they converged in the space DFE in coming to it.

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there is a very great difference between the real object and all the parts of a distant prospect are painted upon the retina, they are all right with respect to one another, as well as the parts of the prospect itself; and we can only judge of an object's being inverted, when it is turned reverse to its natural position with respect to other objects which we see and compare it with.—If we lay hold of an upright stick in the dark, we can tell which is the upper or lower part of it, by moving our hand downward or upward; and know very well that we cannot feel the upper end by moving our hand downward. Just so we find by experience, that upon directing our eyes towards a tall object, we cannot see its top by turning our eyes downward, nor its foot by turning our eyes upward; but must trace the object the same way by the eye to feel it from head to foot, as we do by the hand to feel it; and as the judgment is informed by the motion of the hand in one case, so it is also by the motion of the eye in the other.

In (No. 13.) is exhibited the manner of seeing the same object ABC, by both the eyes D and E at once.

When any part of the image cba falls upon the optic nerve L, the corresponding part of the object becomes invisible. On which account, nature has wisely placed the optic nerve of each eye, not in the middle of the bottom of the eye, but towards the side next the nose, so that whatever part of the image falls upon the optic nerve of one eye, may not fall upon the optic nerve of the other. Thus the point a of the image cba falls upon the optic nerve of the eye D, but not of the eye E; and the point c falls upon the optic nerve of the eye E, but not of the eye D: and therefore, to both eyes taken together, the whole object ABC is visible.

The nearer that any object is to the eye, the larger is the angle under which it is seen, and the magnitude under which it appears. Thus to the eye D, (No. 14.) the object ABC is seen under the angle APC; and its image cba is very large upon the retina: but to the eye E, at a double distance, the same object is seen under the angle APC, which is equal only to half the angle APC, as is evident by the figure. The image cba is likewise twice as large in the eye D, as the other image cba is in the eye E. In both these representations, a part of the image falls on the optic nerve, and the object in the corresponding part is invisible.

As the sense of seeing is allowed to be occasioned by the impulse of the rays from the visible object upon the retina of the eye, and forming the image of the object thereon, and that the retina is only the expansion of the optic nerve all over the choroides; it should seem surprising, that the part of the image which falls on the optic nerve should render the like part of the object invisible; especially as that nerve is allowed to be the instrument by which the impulse and image are conveyed to the common fenory in the brain. But this difficulty vanishes, when we consider that there is an artery within the trunk of the optic nerve, which entirely obscures the image in that part, and conveys no sensation to the brain.

That the part of the image which falls upon the middle of the optic nerve is lost, and consequently the correspond-
Tall el to the eye after faffing through the glasses; and then, by entering the eye at C, they will be converged to as many different points on the retina, and form a large inverted picture AB upon it, as in the figure.

To find how much this glass magnifies, divide the least distance (which is about six inches) at which an object can be seen distinctly with the bare eye, by the focal distance of the glass; and the quotient will show how much the glass magnifies the diameter of the object.

The double or compound microscope, (No. 18.) consists of an object-glass cd, and an eye-glass ef. The small object ab is placed at a little greater distance from the glass cd than its principal focus, so that the pencils of rays flowing from the different points of the object, and passing through the glasses, may be made to converge and unite in as many points between g and h, where the image of the object will be formed; which image is viewed by the eye through the eye-glass ef. For the eye-glasses being so placed, that the image gh may be in its focus, and the eye much about the same distance on the other side, the rays of each pencil will be parallel, after going out of the eye-glasses, as at e and f; till they come to the eye at k, where they will begin to converge by the refractive power of the humours; and after having crossed each other in the pupil, and passed through the chrysaline and vitreous humours, they will be collected into point s on the retina, and form the large inverted picture AB thereon.

The magnifying power of this microscope is as follows. Suppose the image gh to be six times the distance of the object ab from the object-glass cd; then will the image be six times the length of the object: but since the image could not be seen distinctly by the bare eye at a less distance than six inches, if it be viewed by an eye-glass ef, of one inch focus, it would thereby be brought six times nearer the eye; and consequently viewed under an angle six times as large as before; so that it will be again magnified six times; that is, six times by the object-glass, and six times by the eye-glass; which multiplied into one another, makes 36 times; and so much is the object magnified in diameter more than what it appears to the bare eye; and consequently 36 times 36, or 1296 times, in surface.

But, because the extent or field of view is very small in this microscope, there are generally two eye-glasses placed sometimes close together, and sometimes in an inch asunder; by which means, although the object appears less magnified, yet the visible area is much enlarged by the interpolation of a second eye-glass, and consequently a much pleasanter view is obtained.

The solar microscope, (No. 19.) invented by Dr. Lieberkun, is constructed in the following manner. Having procured a very dark room, let a round hole be made in the window-flutter, about three inches diameter, through which the sun may cast a cylinder of rays AA into the room. In this hole, place the end of a tube, containing two convex glasses and an object, viz. 1. A convex glass as, of about two inches diameter, and three inches focal distance, is to be placed in that end of the tube which is put into the hole. 2. The object bb, being put between two glasses (which must be concave to hold it at liberty) is placed about two inches and a half from the glass cc. A little more than a quarter of an inch from the object is placed the small convex glasses cc, whose focal distance is a quarter of an inch.

The tube may be so placed, when the sun is low, that his rays AA may enter directly into it: but when he is high, his rays BB must be reflected into the tube by the plane mirror or looking glass CC.

Things being thus prepared, the rays that enter the tube will be conveyed by the glass ab towards the object bb, by which means it will be strongly illuminated; and the rays a which flow from it through the convex glass cc, will make a large inverted picture of the object at DD, which, being received on a white paper, will represent the object magnified in length, in proportion of the distance of the picture from the glass cc, to the distance of the object from the same glass. Thus, suppose the distance of the object from the glass to be 40 parts of an inch, and the distance of the distinct picture to be 12 feet or 144 inches, in which there are 1440 tenths of an inch; and this number divided by 3 tenths, gives 480; which is the number of times the picture is longer or broader than the object; and the length multiplied by the breadth, shews how much the whole surface is magnified.

Of Telescopes.

Before we enter upon the description of telescopes, it will be proper to shew how the rays of light are affected by passing through concave glasses, and also by falling upon concave mirrors.

When parallel rays, as abedegh, (No. 20.) pass directly through a glass AB, which is equally concave on both sides, they will diverge after passing through the glass, as if they had come from a radiant point C, in the centre of the glass's concavity; which point is called the negative or virtual focus of the glass. Thus the ray a, after passing through the glass AB, will go on in the direction d, as if it had proceeded from the point C, and no glass been in the way. The ray b will go on in the direction m; the ray c in the direction o, &c.—The ray C, that falls directly upon the middle of the glass, suffers no refraction in passing through it; but goes on in the same rectilinear direction, as if no glass had been in its way.

If the glass had been concave only on one side, and the other side quite plane, the rays would have diverged, after passing through it, as if they had come from a radiant point at double the distance of C from the glass; that is, as if the radiant had been at the distance of a whole diameter of the glass's concavity.

If rays come more converging to such a glass, than parallel rays diverge after passing through it, they will continue to converge after passing through it; but will not meet so soon as if no glass had been in the way, and will incline towards the same side, to which they would have diverged if they had come parallel to the glass. Thus the rays f and h, going in a converging line towards the edge of the glass at B, and converging more in their way to it than the parallel rays diverge after passing through it, they will go on converging after they pass through it, though
thougla In a lefs degree t’han they did before, and will upon a concave mirror AB (which is not transparent, but has only the surface AB of a clear polish,) they will be reflected back from that mirror, and meet in a point m, at half the distance of the surface of the mirror from C the centre of its concavity; for they will be reflected at as great an angle from a perpendicular to the surface of the mirror, as they fell upon it with regard to that perpendicular, but on the other side thereof. Thus, let C be the centre of concavity of the mirror AB; and let the parallel rays dfa, Cmb, and ecle, fall upon it at the points a, b, and c. Draw the lines Cia, Cmb, and Cche, from the centre C to these points; and all these lines will be perpendicular to the surface of the mirror, because they proceed thereto like fo many radii or spokes from its centre. Make the angle Cab equal to: the angle dac, and draw the line amb, which will be the direction of the ray dfa, after it is reflected from the point a of the mirror; so that the angle of incidence dac, is equal to the angle of reflection Cab; the rays making equal angles with the perpendicular Cia on its opposite sides.

Draw also the perpendicular Cche to the point c, where the ray ecle touches the mirror; and, having made the angle Cei equal to the angle Cce, draw the line cmi, which will be the course of the ray ecle, after it is reflected from the mirror.

The ray Cmb passing through the centre of concavity of the mirror, and falling upon it at b, is perpendicular to it; and is therefore reflected back from it in the same line bmc.

All these reflected rays meet in the point m; and in that point the image of the body which emits the parallel rays dfa, Cgb, and ecle, will be formed; which point is distant from the mirror equal to half the radius bmc of its concavity.

The rays which proceed from any celestial object may be esteemed parallel at the earth; and therefore, the images of that object will be formed at m, when the reflecting surface of the concave mirror is turned directly towards the object. Hence, the focus m of parallel rays is not in the centre of the mirror’s concavity, but half way between the mirror and that centre.

The rays which proceed from any remote terrestrial object, are nearly parallel at the mirror; not strictly so, but come diverging to it, in separate pencils, or, as it were, bundles of rays, from each point of the side of the object next the mirror; and therefore they will not be converged to a point at the distance of half the radius of the mirror’s concavity from its reflecting surface, but into separate points at a little greater distance from the mirror. And the nearer the object is to the mirror, the farther these points will be from it; and an inverted image of the object will be formed in them, which will seem to hang pendant in the air; and will be seen by an eye placed beyond it (with regard to the mirror) in all respects like the object, and as distinct as the object itself.

Let AEB, (No. 22.) be the reflecting surface of a mirror, whose centre of concavity is at C; and let the upright object DE be placed beyond the centre C, and send out a conical pencil of diverging rays from its upper extremity D, to every point of the concave surface of the mirror AEB. But to avoid confusion, we only draw three rays of that pencil, as DAB, DCE, DBF.

From the centre of concavity C, draw the three right lines CA, Ce, CB, touching the mirror in the same points where the forefaid rays touch it; and all these lines will be perpendicular to the surface of the mirror. Make the angle CAB equal to the angle DCA, and draw the right line Ad for the course of the reflected ray DA; make the angle CDa equal to the angle DCA, and draw the right line ed for the course of the reflected ray DB: make also the angle CBe equal to the angle DBC, and draw the right line Be for the course of the reflected ray DB. All these reflected rays will meet in the point d, where they will form the extremity d of the inverted image ed, similar to the extremity D of the upright object DE.

If the pencil of rays Esa, Esb, be also continued to the mirror, and their angles of reflection from it be made equal to their angles of incidence upon it, as in the former pencil from D, they will all meet at the point e by reflection, and form the extremity e of the image ed, similar to the extremity E of the object DE.

And as each intermediate point of the object, between D and E, sends out a pencil of rays in like manner to every part of the mirror, the rays of each pencil will be reflected back from it, and meet in all the intermediate points between the extremities e and d of the image; and so the whole image will be formed, not at i, half the distance of the mirror from its centre of concavity C; but at a greater distance, between i and the object DE; and the image will be inverted with respect to the object.

This being well understood, the reader will easily see how the image is formed by the large concave mirror of the reflecting telescope, when he comes to the description of that instrument.

When the object is more remote from the mirror than its centre of concavity C, the image will be less than the object, and between the object and mirror; when the object is nearer than the centre of concavity, the image will be more remote and bigger than the object: thus, if DE be the object, ed will be its image: for, as the object recedes from the mirror, the image approaches nearer to it; and as the object approaches nearer to the mirror, the image recedes farther from it; on account of the lesser or greater divergency of the pencils of rays which proceed from the object: for, the less they diverge, the sooner they are converted to points by reflection; and the more they diverge, the farther they must be reflected before they meet.

If the radius of the mirror’s concavity, and the distance of the object from it, be known, the distance of the image from the mirror is found by this rule: Divide the product of the distance and radius by double the distance made less by the radius, and the quotient is the distance required.

If the object be in the centre of the mirror’s concavity,
In a reflecting telescope, the glass which is nearest the object in viewing it is called the object-glass, and that which is nearest the eye is called the eye-glass. The object-glasses must be convex, but the eye-glasses may be either convex or concave: and generally, in looking through a telescope, the eye is in the focus of the eye-glass; though that is not very material, for the distance of the eye, as to distant vision, is indifferent, provided the rays of the pencils fall upon it parallel: only, the nearer the eye is to the end of the telescope, the larger is the scope or area of the field of view.

Let $cd$ (No. 23.) be a convex glass fixed in a long tube, and have its focus at $E$. Then, a pencil of rays $gh$, flowing from the upper extremity $A$ of the remote object $AB$, will be so refracted by passing through the glass, as to converge and meet in the point $e$; and the pencil of rays $klm$, flowing from the lower extremity $B$ of the same object $AB$, and passing through the glass, will converge and meet in the point $e$ and the images of the points $A$ and $B$ will be formed in the points $f$ and $e$. And as all the intermediate points of the object, between $A$ and $B$, send out pencils of rays in the same manner, a sufficient number of these pencils will pass through the object-glass $cd$, and converge to as many intermediate points between $e$ and $f$; and so will form the whole inverted image $EF$ of the distant object. But because this image is small, a concave glass $no$ is so placed in the end of the tube next the eye, that its virtual focus may be at $F$. And as the pencils of rays pass converging through the concave glass, but converge less after passing through it than before, they go on further, as to $b$ and $a$, before they meet; and the pencils themselves being made to diverge by passing through the concave glass, they enter the eye, and form the large picture $ab$ upon the retina, whereon it is magnified under the angle $bFa$.

But this telescope has one inconvenience which renders it unfit for most purposes, which is, that the pencils of rays being made to diverge by passing through the concave glass $no$, very few of them can enter the pupil of the eye; and therefore the field of view is but very small, as is evident by the figure. For none of the pencils which either from the top or bottom of the object $AB$ can enter the pupil of the eye at $C$, but are all slopt by falling upon the iris above and below the pupil: and therefore, only the middle part of the object can be seen when the telescope lies directly towards it, by means of those rays which proceed from the middle of the object. So that to see the whole of it, the telescope must be moved upwards and downwards, unless the object be very remote; and then it is never seen distinctly.

This inconvenience is remedied by substituting a convex eye-glass, as $gh$, (No. 24.) in place of the concave one; and fixing it so in the tube, that its focus may be coincident with the focus of the object-glass $cd$, as at $E$. For then, the rays of the pencils flowing from the object $AB$, and passing through the object-glass $cd$, will meet in its focus, and form the inverted image $mEp$: and as the image is formed in the focus of the eye-glass $gh$, the rays of each pencil will be parallel, after passing through that glass, but the pencils themselves will cross in its focus on the other side, as at $e$: and the pupil of the eye being in this focus, the image will be viewed through the glass, under the angle $gsh$: and being at $E$, it will appear magnified, so as to fill the whole space $CmEpD$.

But, as this telescope inverts the object with respect to the object, it gives an unpleasant view of terrestrial objects; and is only fit for viewing the heavenly bodies, in which we regard not their position, because their being inverted does not appear on account of their being round. But whatever way the object seems to move, this telescope must be moved the contrary way, in order to keep sight of it; for, since the object is inverted, its motion will be so too.

The magnifying power of this telescope is as the focal distance of the object-glass to the focal distance of the eye-glass. Therefore, if the former be divided by the latter, the quotient will express the magnifying power.

When we speak of the magnifying of a telescope or micro-

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the focal distance of the object-glass be ten times as great as the focal distance of the eye-glass; then, the object will be magnified ten times, both in length and breadth; and 10 multiplied by 10, produces 100; which shows, that the area of the object will appear 100 times as big when seen through such a telescope, as it does to the bare eye.

Hence it appears, that if the focal distance of the eye-glasses were equal to the focal distance of the object-glass, the magnifying power of the telescope would be nothing.

This telescope may be made to magnify in any given degree, provided it be of a sufficient length. For, the greater the focal distance of the object-glass, the less may be the focal distance of the eye-glasses; though not directly in proportion. Thus, an object-glass, of 10 feet focal distance, will admit of an eye-glass whose focal distance is little more than 2.5 inches; which will magnify near 48 times: but an object-glass, of 100 feet focus, will require an eye-glass somewhat more than 6 inches; and will therefore magnify almost 200 times.

A telescope for viewing terrestrial objects, should be so constructed, as to shew them in their natural posture. And this is done by one object-glass, (No. 25.) and three eye-glasses, ef, gb, ik. So placed, that the distance between any two, which are nearest to each other, may be equal to the sum of their focal distances; as in the figure, where the focus of the glasses ed and ef meet at F, those of the glasses ed and gb meet at I, and of gb and ik at m; the eye being at n, in or near the focus of the eye-glasses ik, on the other side. Then, it is plain, that these pencils of rays, which flow from the object AB, and pass through the object-glass cd, will meet and form an inverted image CFD in the focus of that glass; and the image being also in the focus of the glass ef, the rays of the pencils will become parallel, after passing through that glass, and cross at I, in the focus of the glass ef, from whence they pass on to the next glass gb, and by going through it they are converted to points in its other focus, where they form an erect image EnF of the object AB; and as this image is also in the focus of the eye-glasses ik, and the eye on the opposite side of the same glass; the image is viewed through the eye-glasses in this telescope, in the same manner as through the eye-glasses in the former one; only in a contrary position, that is, in the same position with the object.

The three glasses next the eye have all their focal distances equal; and the magnifying power of this telescope is found the same way as that of the last above; viz. by dividing the focal distance of the object-glass cd, by the focal distance of the eye-glasses ik, or gb, or ef, since all these three are equal.

When the rays of light are separated by refraction, they become coloured; and if they be united again, they will be a perfect white. But those rays which pass through a convex glass near its edges are more unequally refracted than those which are nearer the middle of the glass. And when the rays of any pencil are unequally refracted by the glass, they do not all meet again in one and the same point, but in separate points; which makes the image indistinct, and coloured, about its edges. The remedy is, to have a plate with a small round hole in its middle, fixed in the tube at m, parallel to the glasses.

For, the wandering rays about the edges of the glasses will be stoped, by the plate, from coming to the eye; and none admitted but those which come through the middle of the glass, or at least at a good distance from its edges, and pass through the hole in the middle of the plate. But this circumscribes the image, and lessens the field of view, which would be much larger if the plate could be dispensed with.

The great inconvenience attending the management of long telescopes of this kind, has brought them much into disuse ever since the reflecting telescope was invented. For one of this sort, six feet in length, magnifies as much as one of the other an hundred. It was invented by Sir Isaac Newton, but has received considerable improvements since his time; and is now generally constructed in the following manner, which was first proposed by Dr. Gregory.

At the bottom of the great tube TTTT, (No. 26.) is placed the large concave mirror DUUF, whose principal focus is at m; and in its middle is a round hole P, opposite to which is placed the small mirror L, concave toward the great one; and so fixed to a strong wire M, that it may be moved farther from the great mirror, or nearer to it, by means of a long screw on the outside of the tube, keeping its axis still in the same line Pn with that of the great one.—Now, since in viewing a very remote object, we can scarce see a point of it but what is as least as broad as the great mirror, we may consider the rays of each pencil, which flow from every point of the object, to be parallel to each other, and to cover the whole reflecting surface DUUF. But to avoid confusion in the figure, we shall only draw two rays of a pencil flowing from each extremity of the object into the great tube, and trace their progress, through all their reflections and refractions, to the eye f, at the end of the small tube tt, which is joined to the great one.

Let us then suppose the object AB to be at such a distance, that the rays B may flow from its lower extremity B, and the rays E from its upper extremity A. Then the rays C falling parallel upon the great mirror at D, will be thence reflected converging, in the direction DG, and by crossing at I in the principal focus of the mirror, they will form the upper extremity I of the inverted image IK, similar to the lower extremity B of the object AB: and passing on to the concave mirror L (whose focus is at n) they will fall upon it at g, and be thence reflected converging, in the direction gN, because gm is longer than gn; and passing through the hole P in the large mirror, they would meet somewhere about r, and form the lower extremity B of the erect image AB, similar to the lower extremity B of the object AB. But by passing through the plano-convex glass R in their way, they form that extremity of the image at b. In like manner, the rays E, which come from the top of the object AB,
AB, and fall parallel upon the great mirror at F, are then reflected converging to its focus, where they form the lower extremity K of the inverted image IK, similar to the upper extremity A of the object AB; and thence passing on to the small mirror L, and falling upon it at b, they are then reflected in the converging plane at H0; and going on through the hole P of the great mirror, they would meet somewhere about q, and form there the upper extremity a of the erect image ab, similar to the upper extremity A of the object AB: but by passing through the convex glass R in their way, they meet and cross sooner, as at a, where that point of the erect image is formed.—The like being understood of all those rays which flow from the intermediate points of the object between A and B, and enter the tube TT; all the intermediate points of the image between a and b will be formed; and the rays passing on from the image, through the eye-glasses S, and through a small hole e in the end of the latter tube tt, they enter the eye f, (which sees the image ab by means of the eye-glasses) under the large angle eed, and magnified in length under that angle from e to d.

In the best reflecting telescopes, the focus of the small mirror is never coincident with the focus n of the great one; where the first image IK is formed, but a little behind it (with respect to the eye) as at n: the consequence of which is, that the rays of the pencils will not be parallel after reflection from the small mirror, but converge to as to meet in points about q, r, s; where they would form a larger upright image than ab, if the glass R was not in their way; and this image might be viewed by means of a single eye-glass properly placed between the image and the eye; but then the field of view would be less, and consequently not so pleasant; for which reason, the glass R is still retained, to enlarge the scope or area of the field.

To find the magnifying power of this telescope, multiply the focal distance of the great mirror by the distance of the small mirror from the image next the eye, and multiply the focal distance of the small mirror by the focal distance of the eye-glasses; then, divide the product of the former multiplication by the product of the latter, and the quotient will express the magnifying power.

We shall here set down the dimensions of one of Mr. Short's reflecting telescopes, as described in Dr. Smith's optics.

The focal distance of the great mirror 0.6 inches, its breadth 2.3; the focal distance of the small mirror 1.5, its breadth 0.6; the breadth of the hole in the great mirror 0.5; the distance between the small mirror and the next eye-glass 1.4; the distance between the two eye-glasses 2.4; the focal distance of the eye-glasses next the metals 3.8; and the focal distance of the eye-glasses next the eye 1.1.

One great advantage of the reflecting telescope is, that it will admit of an eye-glass of a much shorter focal distance than a refracting telescope will; and, consequently, it will magnify so much the more: for the rays are not coloured by reflection from a concave mirror, if it be ground to a true figure, as they are by passing through a convex glass, let it be ground ever so true.

The adjusting screw on the outside of the great tube fits this telescopes to all sorts of eyes, by bringing the small mirror either nearer to the eye, or removing it farther; by which means, the rays are made to diverge a little for short-sighted eyes, or to converge for those of a long sight.

The nearer an object is to the telescope, the more its pencils of rays will diverge before they fall upon the great mirror, and therefore they will be the longer of meeting in points after reflection; so that the first image IK will be formed at a greater distance from the large mirror, when the object is near the telescope, than when it is very remote. But as this image must be formed farther from the small mirror than its principal focus n, this mirror must be always set at a greater distance from the large one, in viewing near objects, than in viewing remote ones. And this is done by turning the farew on the outside of the tube, until the small mirror be so adjusted, that the object (or rather its image) appears perfect.

In looking through any telescope towards an object, we never see the object itself, but only that image of it which is formed next the eye in the telescope. For if a man holds his finger or a flick between his bare eye and an object, it will hide part (if not the whole) of the object from his view. But if he ties a flick across the mouth of a telescope before the object-glass, it will hide no part of the imaginary object he saw through the telescope before, unless it covers the whole mouth of the tube: for, all the effect will be, to make the object appear dimmer, because it intercepts part of the rays. Whereas, if he puts only a piece of wire across the inside of the tube, between the eye-glass and his eye, it will hide part of the object which he thinks he sees: which proves, that he sees not the real object, but its image. This is also confirmed by means of the small mirror L, in the reflecting telescope, which is made of opaque metal, and stands directly between the eye and the object towards which the telescope is turned; and will hide the whole object from the eye at e, if the two glasses R and S are taken out of the tube.

Of the Multiplying Glass.

The multiplying glass is made by grinding down the round side bH (No. 27.) of a convex glass AB, into several flat surfaces, as bb, bb, dd, &c. An object C will not appear magnified when seen through this glass by the eye at H, but it will appear multiplied into as many different objects as the glass contains plane surfaces. For since rays will flow from the object C to all parts of the glass, and each plane surface will reflect these rays to the eye, the same object will appear to the eye in the direction of the rays which enter it through each surface. Thus, a ray gH, falling perpendicularly on the middle surface, will go through the glass to the eye without suffering any refraction; and will therefore shew the object in its true place at C; whilst a ray ab flowing from the same object, and falling obliquely on the plane surface bb, will be refracted in the direction aH, by passing through the glass; and upon leaving it, will go on to the eye in the direction dH; which will cause the same object C to appear also at E, in the direction of the ray Hc, produced in the right line Hen. And the ray cd, flowing from the
the object C, and falling obliquely on the plane of the surface at D, will be refracted (by passing through the glass and leaving it at f) to the eye at H; which will cause the same object to appear at D in the direction H/m. — If the glass be turned round the line gH, as an axis, the object C will keep its place, because the plane basis is not removed; but all the other objects will seem to go round C, because the oblique planes, on which the rays ab ed fall, will go round by the turning of the glass.

Of the Camera Obscura.

The camera obscura is made by a convex glass CD, (No. 28.) placed in a hole of a window-shutter. Then, if the room be darkened so, as no light can enter but what comes through the glass, the pictures of all the objects (as fields, trees, buildings, men, cattle, &c.) on the outside, will be shown in an inverted order, on a white paper placed at GH in the focus of the glass; and will afford a most beautiful and perfect piece of perspective or landscape of whatever is before the glass, especially if the fan shines upon the objects.

If the convex glass CD be placed in a tube in the side of a square box, within which is the plane mirror EF, receding backwards in an angle of 45 degrees from the perpendicular kq, the pencils of rays flowing from the outward objects, and passing through the convex glass to the plane mirror, will be reflected upwards from it, and meet in points, as I and K (at the same distance that they would have met at H and C, if the mirror had not been in the way,) and will form the aforesaid images on an oiled paper stretched horizontally in the direction IK; on which paper, the out-lines of the images may be easily drawn with a black-lead pencil; and then copied on a clean sheet, and coloured by art, as the objects themselves are by nature.—In this machine, it is usual to place a plane glass, unpolished, in the horizontal situation IK, which glass receives the images of the outward objects; and their outlines may be traced upon it by a black-lead pencil.

N. B. The tube in which the convex glass CD is fixed, must be made to draw out, or put in, so as to adjust the distance of that glass from the plane mirror, in proportion to the distance of the outward objects; which the operator does, until he sees their images distinctly pointed on the horizontal glass at IK.

The forming a horizontal image, as IK, of an upright object AB, depends upon the angles of incidence of the rays upon the plane mirror EF, being equal to their angles of reflection from it. For, if a perpendicular be supposed to be drawn to the surface of the plane mirror at e, where the ray A Ae falls upon it, that ray will be reflected upwards in an equal angle with the other side of the perpendicular, in the line edI. Again, if a perpendicular be drawn to the mirror from the point f, where the ray A/fs falls upon it, that ray will be reflected in an equal angle from the other side of the perpendicular, in the line fsI. And if a perpendicular be drawn from the point g, where the ray Aeg falls upon the mirror, that ray will be reflected in an equal angle from the other side of the perpendicular, in the line giI. So that all the rays of the pencil abc, flowing from the upper extremity of the object AB, and passing through the convex glass CD, to the plane mirror EF, will be reflected from the mirror, and meet at I, where they will form the extremity I of the image IK, similar to the extremity A of the object AB. The like is to be understood of the pencil gis, flowing from the lower extremity of the object AB, and meeting at K (after reflection from the plane mirror) the rays form the extremity K of the image, similar to the extremity B of the object; and so of all the pencils that flow from the intermediate points of the object to the mirror, through the convex glass.

Of the Opera-Glass.

If a convex glass, of a short focal distance, be placed near the plane mirror in the end of a short tube, and a convex glass be placed in a hole in the side of the tube, so as the image may be formed between the last mentioned convex glass and the plane mirror; the image being viewed through this glass, will appear magnified.—In this manner, the opera-glasses are constructed; with which a gentleman may look at any lady at a distance in the company, and the lady know nothing of it.

Of the Common Looking-Glass.

The image of any object that is placed before a plane mirror appears as big to the eye as the object itself; and is erect, distinct, and seemingly as far behind the mirror, as the object is before it; and that part of the mirror, which reflects the image of the object to the eye (the eye being supposed equally distant from the glass with the object) is just half as long and half as broad as the object itself. Let AB (No. 29.) be an object placed before the reflecting surface ghI of the plain mirror CD; and let the eye be at o. Let Ab be a ray of light flowing from the top A of the object and falling upon the mirror at b, and bm be a perpendicular to the surface of the mirror at b; the ray Ab will be reflected from the mirror to the eye at e, making an angle who equal to the angle Abm; then will the top of the image E appear to the eye in the direction of the reflected ray ob produced to E, where the right line ApE, from the top of the object, cuts the right line oBE, at E. Let Bi be a ray of light proceeding from the foot of the object at B to the mirror at i; and ni a perpendicular to the mirror from the point i, where the ray Bi falls upon it; this ray will be reflected in the line is, making an angle nis equal to the angle Bin, with that perpendicular, and entering the eye at o; then will the foot F of the image appear in the direction of the reflected ray si, produced to F, where the right line BF cuts the reflected ray produced to F. All the other rays that flow from the intermediate points of the object AB, and fall upon the mirror between b and i, will be reflected to the eye at o; and all the intermediate points of the image EF will appear to the eye in the direction of these reflected rays produced. But all the rays that flow from the object, and fall upon the mirror above b, will be reflected back above the eye at o; and all the rays that flow from the object, and fall upon the mirror below i, will be reflected back below the
duced to \( F \), beyond the glass. And a ray \( B D \), flowing intermediate rays from \( A \) to \( B \). Hence, if the man \( AB \) reflected ray \( AD \), produced to \( F \), where it is cut by the glass, is exactly equal to his own size. For, a ray \( BD \), flowing from his foot, and falling obliquely on the glass at \( D \), will be reflected as obliquely on the other side of the glass. And so, the eye of his image will appear at \( F \), in the same line produced to \( E \), beyond the glass. And a ray \( BE \), flowing from his eye at \( A \), and falling perpendicularly upon the surface of the glass at \( C \), is reflected back to his eye, in the same line \( CA \); and the image of his eye will appear at \( E \), in the same line produced to \( E \), beyond the glass. And a ray \( BE \), flowing from his eye at \( A \), and falling perpendicularly upon the glass at \( D \), will be reflected as obliquely on the other side of the glass. And so, the eye of his image will appear at \( F \), in the direction of the line \( ADF \).

If the glass be brought nearer the man \( AB \), as supposed to \( ob \), he will see his image as at \( C D F \) : for the reflected ray \( CA \) (being perpendicular to the glass) will shew the eye of the image as at \( C \); and the incident ray \( Bb \), being reflected in the line \( A \), will shew the foot of his image as at \( C \); the angle of reflection \( ab \), being always equal to the angle of incidence \( Bba \); and so of all the intermediate rays from \( A \) to \( B \). Hence, if the man \( AB \) advances towards the glass \( CD \), his image will approach towards it; and if he recedes from the glass, his image will also recede from it.

Of the Magic Lantern.

ABCD (No. 31.) is a tin lantern, with a tube \( nkkm \), fixed in the side of it. This tube consists of two joints, one of which slips into the other; and by drawing this joint out, or pushing it in, the tube may be made longer or shorter. At \( kl \) in the end of the moveable joint of the tube a convex lens is fixed, and an object painted with transparent colours upon a piece of thin glass is placed at \( de \) somewhere in the immovable joint of the tube; so that as the tube is lengthened or shortened, the lens will be either at a greater or a less distance from this transparent object. In the side of the lantern there is a very convex lens \( bhbc \), which serves to call a very strong light from the candle within the lantern upon the object \( de \). Now when the rays, which shine through the object \( de \), diverge from the several points as \( d, e, \&c. \) in the object, and fall upon the lens \( kl \), they will be made to converge to as many points \( f, g, \&c. \) on the other side of the lens, and will print an inverted picture of the object at \( fg \) upon a white wall, a sheet or a screen of white paper, provided the object is farther from the lens than its principal focus. To make this picture appear distinct and bright, it must have no other light fall upon it but what comes through the lens \( kl \); and for this reason the whole apparatus is to be placed in a dark room \( EFGH \). The lens \( kl \) must be very convex, so that the object \( de \) may be very near to it, and yet not be nearer than its principal focus: for by this means, as the object is near to the lens, the picture \( fg \) will be at a great distance from it, and consequently the picture will be much bigger than the object. Since the picture is inverted with respect of the object, in order to make the picture appear with the right end upwards, it is necessary that the object \( de \) should be placed with the wrong end upwards.

Of the Different Refrangibility of Light.

We have hitherto supposed that a particle of light, as it comes from the sun, is the least particle into which light can be separated. But we must now correct this supposition, by shewing, that a particle of light, as it comes from the sun, is, properly speaking, a bundle of rays, which may be separated from one another. Therefore, for the future, by a ray of light we must be understood to mean, not that collection of particles which we have hitherto called by this name, but the least particles into which light can be separated.

Rays of light are said to be differently refrangible, when at the same or equal angles of incidence some are more turned out of the ray than others.

Rays are said to be differently reflecting, if some are more easily reflected than others.

Light is called homogeneous, when all the rays are equally refrangible: it is called heterogeneous, when some rays are more refrangible than others.

The colours of homogeneous light are called primary or simple colours; and those of heterogeneous light are called secondary or mixed.

The rays of the sun are not all equally refrangible: and those rays, which have a different degree of refrangibility, have likewise a different colour.

If a beam of light \( SF \), (No. 32.) that comes from the sun, passes into a dark room through \( F \) a round hole in a window shutter \( EG \); this beam proceeding straight forwards, and falling upon a paper at \( Y \), would make a round picture of the sun. This picture would be a confused one indeed, if the hole is a large one and there is no lens in the hole. However, as this round spot of light is a picture of the sun, we shall hereafter, notwithstanding its confusion, call it by this name. Now if a glass prism \( ABC \) is placed between the hole in the window shutter and the paper at \( Y \), the rays of this beam, by the refraction which they suffer in the prism, will be bent from their straight course, and instead of going on so as to fall upon the paper at \( Y \), they will be turned upwards, and the picture of the sun produced by them will fall upon a paper \( MN \) that is placed above \( Y \). If all the rays were
were equally bent upwards, the picture would be a round one upon the paper MN, after the rays have been refracted, as well as when they passed straight forwards and fell upon a paper at Y. But this refracted picture PT is found to be oblong. The horizontal diameter or breadth of this oblong picture is equal to the diameter of the circular one Y, but the perpendicular diameter or height of the picture PT is much greater than its breadth. The refraction is made upwards, and not in a horizontal direction: therefore no alteration ought to be made in the breadth or horizontal diameter of the picture; because no refraction, that is not in the direction of that diameter, can make the picture either broader or narrower. And if all the rays were equally refracted upwards, such a refraction would not change the length of the picture; as it is round when it falls at Y, so it would be round when it is refracted upwards by the prism and falls at PT. This oblong picture consists therefore of rays, which are differently refrangible: they all fall at equal angles of obliquity upon BC the first side of the prism, but in the refraction some are more turned out of the way than others; those rays which go to P, the upper part of the picture, are the most refrangible; and those which go to T, the lower part of it, are least refrangible: the rest, which fall between P and T, have intermediate degrees of refrangibility.

This oblong picture is of different colours in different parts of it. The most refrangible rays at P are violet, the least refrangible at T are red; the rays of intermediate refrangibility from the violet downwards to the red are indigo-coloured, blue, green, yellow, and orange. So that the whole picture is made up of rays of these seven different colours. We may from hence see the reason why the coloured picture consisting of differently refrangible rays should be oblong, in such a manner that the two sides of it are right lines, and the two ends semicircles. For it consists (as in No. 33.) of seven circles, the highest of which PAGQ is violet, the lowest STN is red; the five intermediate ones, BH, CI, DK, EL, OM, are indigo coloured, blue, green, yellow, and orange. The white round picture Y, (No. 32.) is formed by heterogeneous rays, that are of seven different sorts, distinguished from one another by their different degrees of refrangibility and different colours. The refraction of the prism separates these rays from one another by refracting some of them more and others less. And consequently the refracted picture will consist of seven round pictures one below another. These round pictures are so near to each other, that the highest of them APGR will mix itself with some of those below it, as with BH and COI. This nearness of these several round pictures to each other will prevent their colours from being distinctly seen; it will likewise make the sides AS, GN, which are composed of small arcs of circles very close to one another, appear like right lines; but the two ends P and T will be semicircles.

If the centres of these circles continue at the same distance from one another, and the circles themselves are made less, as aep, bb, ei, dk, el, om, sn, they will then be distinct or will not mix with each other; and as the colours of the several parts will by this means be kept separate, so the refracted rays, instead of forming one continued oblong picture, will form seven small circular ones placed in a line perpendicular to the horizon. This separation of the several parts in the refracted picture from each other is brought about, (as in No. 34.) by making the hole F in the window-shutter very small, and by collecting the rays that come through it with a convex lens MN. For this will make a very small white picture of the sun at L, if there is no prism abc: but the refraction of this prism, if it is placed a little beyond the lens, will separate the heterogeneous rays by refracting them upwards; and instead of one small round and white picture at L, there will be seven small round pictures at PT, of which r will be violet, s indigo, t blue, u green, l yellow, y orange, z red.

That the prism ABC (No. 32.) does not make the rays diverge, so as to spread over the space PT, upon any other account but their different refrangibility, will be evident, if (as in No. 35.) a second prism DH is placed beyond the first abc. For if the rays that come from S and pass through the hole F of the window-shutter EG, were by the first prism abc made to diverge and form the oblong picture PT upon any other account besides their different refrangibility; then, supposing a second prism DH to be placed at right angles to the former, the effect must be this; the first prism abc makes the rays diverge from one another in a line PT perpendicular to the horizon, and consequently the second prism DH must make them diverge from one another in a line parallel to the horizon; so that the second prism would increase the breadth of the picture, as much as the first increased its length; and as one prism alone makes the picture a long one, both of them together would make it square, as Pst. But this second refraction does not alter the figure of the picture, but only the position of it: the second prism refracts the picture sideways; and those rays, which fell the highest at P after the first refraction, are refracted sideways the most by the second prism; those rays which fell the lowest at T are refracted sideways the least; by which means the picture, though it continues oblong, will not be perpendicular to the horizon as PT was, but will be inclined so as to lie in the position pt. This makes it evident, that the spreading of the rays by the first refraction was owing to their different refrangibility, and to no other cause. It must be owing to their different refrangibility, because those which were most refracted upwards by the first prism are most refracted sideways by the second. It cannot be owing to any other cause, because if it was, the second prism would spread the rays in breadth as much as the first prism spreads them in length, and both prisms would make the picture square.

Those rays of light, which are most refrangible, are likewise most reflexible.

When a beam of light is admitted into a dark chamber through the hole F in the window-shutter EG, (No. 36.) and this beam falls upon a prism ABC, the fides of which AC and AB are equal, and the angle at A a right one; when the obliquity of these rays, as they are to pass out of the prism at its base BC, is less than 40 degrees, the greatest part of the beam will pass out, but some few rays will
will be reflected at the surface BC. The rays, which pass through the base, form an oblong coloured picture HK, where MH is a more refrangible ray, and MK a less refrangible one. If the few rays of the beam, which are reflected from M in the direction MN, are made to pass through another prism XYV, they will likewise form an oblong coloured picture pt, where p is the most refrangible and t the least refrangible ray. This picture will be a very faint one, because there are but few rays reflected from M.

Now if the prism ACB is turned slowly round upon its axis in the direction ACB, the obliquity of the rays EM to the base BC will keep increasing, till at last this obliquity may become so great, that no rays will pass out at M, but all of them will be reflected. When this total reflection is made, the oblong picture pt, which was faint before, will become much brighter, because then not only a few rays, but all the beam, will be reflected thither. This total reflection will not be made all at once; but as the prism is turned slowly round upon its axis, the most refrangible rays MH will be first reflected, for the violet colour will disappear in the oblong picture HK, whilst all the other colours continue as bright as they were before; and when this colour disappears at HK, the same colour at p will become bright, and all the other colours at pt will continue as faint as they were before. When the prism is turned a little farther upon its axis, the indigo colour, which consists of rays that have the next greatest degree of refrangibility, will be reflected, so that this colour will disappear at HK and will become bright at pt. The same thing will happen to all the rays in their order; as the prism is turned round, each different sort of rays will be reflected sooner as the rays have a greater degree of refrangibility, or latter as they have a less degree. The red rays at K, which are the least refrangible of all, will be reflected last of all. From hence therefore it appears, that the rays of the sun are differently refrangible, and that those which are most refrangible are likewise most reflexible.

Homogeneous light is refracted regularly without any dilatation or scattering of the rays.

When the rays of any one particular colour in the oblong picture of the sun, as the green rays, for instance, are separated from one another; if some of these green rays which are homogeneous, or are all equally refrangible, are transmitted through a very small round hole in a stiff pasteboard, and are refracted by a prism on the other side of the hole, the picture formed by these green rays after refraction upon a white paper held beyond the prism will not be oblong, but circular, as the hole is through which they passed. Therefore this homogeneous light is not dilated, nor are the rays of it scattered by this refraction.

The confused appearance of objects, when they are seen through refracting bodies, is owing to the different refrangibility of light.

If flies, or the letters of a small print, or any other minute objects, are placed in heterogeneous light, such as a direct beam of the sun's, which has never been separated by any refraction into its homogeneous parts; these objects being viewed through a glass-prism will be seen confusedly, their edges will appear so misty that the smaller parts of minute animals cannot easily be distinguished from one another, and the letters of the small print cannot be read. But if the same objects are placed in a beam of homogeneous light, which is separated from all other rays of a different refrangibility in the manner already described, they will appear as distinct through a prism as if they were viewed with the naked eye. Therefore we may conclude, that this confusion is owing to the different refrangibility of those rays which come from the objects; since objects never appear confused when they are seen through refracting bodies, unless they are enlightened with several sorts of rays which have different degrees of refrangibility.

It is probable that any single ray of the least refrangible sort contains a greater quantity of matter than any single ray of the most refrangible sort.

We have already seen, that at the same angles of incidence violet rays will be more refracted or more turned out of the way than red rays. And we have likewise seen, that rays are refracted when they pass out of one medium into another, by being either more or less attracted in one medium than they are in the other. Now since, when all other circumstances are equal, red and violet rays fall at equal obliquities, and are to pass out of glass into air, so that the mediums, and consequently the attractive force or cause of refraction, is given; if the cause can turn the violet rays more out of the way, or refract them more, than it does the red rays, these rays must have different moments; the most refrangible rays, or those which are most easily turned out of the way, have the least moment; and the least refrangible rays, or those which are most difficult to turn out of the way, have the greatest moment. But if all sorts of rays have the same velocity, their respective quantities of matter will be as their moments; and consequently any single ray of the most refrangible sort contains a less quantity of matter than any single ray of the least refrangible sort.

It may be upon this account that a red colour, or a pale purple, is least pleasant to the eye than a blue, green, or a yellow. The red rays strike the eye with so great a force as to be offensive to it; and the small force of the pale purple ones will produce too faint a sensation to be agreeable. The intermediate colours are therefore more pleasant to the eye, as the force of the rays is neither too great to be offensive, nor too small to produce a quick and lively sensation.

The colours of homogeneous light are so invariable, that neither any refraction nor any reflection can alter them.

If a beam of homogeneous light passes through a round hole in a pasteboard, and then is refracted by a prism on the other side of the hole, this refraction will make no alteration in the colour of the rays; if they were red, or whatever was their colour, before they entered the prism, their colour will still be the same, when they have passed through it, and fall upon a white paper held beyond the prism. This proves the first part of the proposition, that the
the colours of homogeneous light are to be changed by any
refraction.

Red lead, when it is viewed in open day-light, or when
heterogeneous rays fall upon it, will likewise be red, if
it is placed in homogeneous red light: but red lead, when
it is placed in any other sort of homogeneous light, will
have the same colour with the rays that fall upon it and
are reflected from it: if it is placed in yellow homogeneous
light, it will be yellow; if in green light, it will be
green; or if in blue light, it will be blue. Consequentially
the reflection of the rays from the red lead make no alter-
tation in their colour; for if it did, rays of any sort re-
lected from the lead would be of the same colour, so that
it would appear red in whatever sort of light it was pla-
ted. The same that is here said of red lead, is true of
any other substance of any other colour. Grains, which
are green either in open day-light or in homogeneous green
light, will not change the colour of any homogeneous rays
by reflecting them, but will itself have the same colour
with the rays in which it is placed; it will be red in red
light, or blue in blue light, or yellow in yellow light.

From hence we may conclude, by the way, that a body
is of any particular colour, not because it reflects no other
rays but those of that particular colour, but because it re-
fects those more copiously and others more sparingly.
Red lead, as it appears red in red light, so in green light
it appears green; or in blue light it appears blue: con-
sequently it reflects rays of these sorts, and in the same
manner it might be shewn to reflect all other sorts of rays.
But then the red colour of red lead, when it is placed in
red light, is much brighter than any other colour will be
that it puts on by being placed in another sort of light;
consequently it reflects red rays more copiously than any
other sort of rays; and for this reason, when it is placed
in open day-light, where it reflects all sorts of rays at once,
the red rays are so much more numerous than the rest, as
to make the whole mixture of their own colour.

Colours may be produced by composition, which shall in
appearance be like the colour of homogeneous light:
but then these compound colours will be altered by re-
fration.

When, by means of two holes in the window-shutter
of a dark room and of two prisms, two oblong coloured
pictures are produced; if a circular piece of white paper
is so placed that the red light of one picture and the yel-
low light of the other may fall upon it, this mixture will
produce an orange colour, that in appearance will be like
the primary orange colour. But between the simple and
compound colour, though they are alike in appearance,
there will be this difference; if the circular piece of paper,
when it is enlightened with compound orange, is viewed
through a prism, the rays will be found to be differently
refrangible, and they will, by the refraction of the prism,
be so separated from one another, that the paper seen
through it will appear as two circles, one of which will
be red and the other yellow: whereas, if the same paper,
when it is enlightened with simple or primary orange, is
viewed in like manner through a prism, the rays will be
found to be equally refrangible, and the paper will appear
through the prism, as it does to the naked eye, to be one
orange coloured circle distinctly terminated all round.

The whiteness of the sun's light is compounded of all the
primary colours mixed in a due proportion.

Let the oblong coloured picture (No. 37.) fall upon
the convex lens MN; and then all the rays which are
separated from one another at PT will be collected to-
gether by passing through the lens, and will meet at its
focus G, in such a manner as to form a round picture of
the sun upon a white paper DE. This round picture, which
consists of rays of all sorts, of red, orange, yellow, blue,
green, indigo, and violet, is white. And this whiteness is
compounded of all the primary colours mixed together.

None of the rays change their colour by being mixed with
the rest; each retains the same colour after it is mixed
with the rest that it had before; neither the red rays, nor
the orange, nor the yellow, nor the blue, nor the green,
nor the indigo, nor the violet, are made white by being
mixed with the rest at the focus; but though none of the
parts are white, yet the whole mixture is white.

That the whiteness at the focus G arises from a mixture
of all the primary colours, is evident. For if any of the
colours are intercepted at the lens, the focus loses its
whiteness, and becomes of that colour which arises from a
mixture of those which are not intercepted. Thus if all the
rays at PT are intercepted except the yellow, the orange,
and the red, the focus will not be white, but will be or-
ange-coloured. If all the rays are intercepted at PT, ex-
cept the blue, the green, and the yellow, the focus will
then be green. The orange in one case, and the green in
the other case, is the compound colour arising from a mix-
ture of those rays which are not intercepted. And in
either case, if the rays that were intercepted are again
suffered to pass through the lens, the focus will recover
its whiteness.

It may be more difficult to shew that the rays, when
they are all of them mixed at the focus, retain their pro-
per colours, and are none of them white though the
compound mixture is white. To make this out, let the
paper be removed from DE, where all the rays are mix-
ed upon it at G, to ds, where it will receive the rays,
after they have crooked one another at the focus, and
having got beyond it diverge again. In this position of
the paper, because the rays that were mixed at the focus
have diverged from thence, and are again separated from
one another, the oblong coloured picture will appear a-
gain at tp, so that the red colour T, which was the low-
est at the lens, will be the highest at the paper dp. But
though the colours are thus inverted by passing the focus,
yet all of them appear at tp; which would have been
impossible, if each sort of rays, by being mixed with the
rest at the focus, had lost their colour, and had been made
white. Nor indeed is the colour of any sort of rays at all
changed by being mixed with the rest at the focus; but
the same rays that produced any particular colour in the oblong picture PT are the rays that produce the same colour in the inverted picture tp; as would be evident from intercepting any particular colour at PT: for if the green rays, for instance, are intercepted at PT, there will be no green at tp: or if the red are intercepted at PT, there will then appear no red colour at tp: and the same thing will happen upon intercepting the rays of any other colour at PT, for then that colour will vanish at tp.

Colours may be produced by composition that are neither exactly like any of the primary ones, nor fully white.

If the red rays of one coloured picture are mixed with the violet rays of another, according to the various proportions in which they are mixed, various purples will be produced, such as are not like in appearance to the colour of any homogeneous light; and of these purples, mixed with yellow and blue, may be made other new colours.

By mixing the coloured powders which painters use, though the powders themselves resemble the primary colours, yet the mixture may be grey, or dun, or rufset-brown, such as are the colours of a man's nail, of a moufe, of ashes, of ordinary tones, of mortar, of dust and dirt in the highways. Thus one part of red lead, and five of viride aris, compose a dun colour like that of a moufe. If to porpiment, which is yellow, a full bright purple powder used by painters is added, the mixture may be made of a pale red; and with the addition of a little viride aris, which, as the name imports, is green, and of a light blue bile, this pale red will change to grey or pale white, such as is the colour of ashes, or of wood newly cut, or of a man's skin.

These grey, dun, and rufset colours are only imperfect sorts of white. And we may understand, why the mixture of these coloured powders should produce an imperfect white, and not a full bright one, from the following observation. All coloured powders suppress and stop great part of the light that falls upon them: they reflect more of those rays from whence their colour arises than of any other sort; but they reflect even those more sparingly than white bodies do. Red lead, for instance, reflects fewer red rays than white paper does; for if red lead and white paper are both of them placed in homogeneous red light, the paper will appear of a brighter red than the lead. But if red lead suppresses many red rays, it may well be supposed to suppress many more rays of other colours; since its redness is owing to its reflecting red rays more copiously, and all other rays more sparingly. From hence it follows, that in a mixture of coloured powders, though they reflect rays of all sorts in a due proportion, so that the compound light will not be more of one colour than another, but will be white; yet the whiteness will be much less bright than that of paper; because the mixture of powders suppresses and stops many rays, whereas the paper reflects almost all the rays that fall upon it, and suppresses scarce any. Thus the whiteness in the mixture of powders, and the whiteness in the paper, are both of the same sort, and differ from one another only in degree, or in the quantity of light. Therefore, if some of this mixture of powders is placed in bright furnhine, and a piece of white paper is placed in the shade, the mixture by thus increasing the light, and the paper by thus diminishing it, may be made to appear equally white.

The colours of all bodies are either the simple colours of homogeneous light, or such compound colours as arise from a mixture of homogeneous light.

Each sort of light has a peculiar colour of its own, which no refraction or reflection can change. Therefore the colour of no natural body can be any other than either the colour of some sort of homogeneous light, or a compound colour arising from a mixture of the several sorts. For bodies appear coloured only by reflecting light; and no reflection can give any other colours to the rays but what they had before.

Of the Colours of thin transparent Plates.

Water, air, glass, or any other transparent substance, when drawn out into thin plates, become coloured.

Water, when it is made tenacious by having soap mixed with it, may be blown up into a bubble A, (No. 38.) such as children play with. If this bubble be filled under a glass, so that the motion of the air may not affect it, then as the water glides down the sides of it, and the top of it at A grows thinner, several colours will successively appear at A, and will spread themselves from thence in rings surrounding A, and descending farther and farther down the sides of the bubble, till they vanish at BC in the same order in which they appeared. Thus, for instance, the first colour that appears at A, the top of the bubble, is red: this red spot spreads itself into a circular ring round A, and then the top of the bubble A becomes blue: this blue spot spreads itself in the same manner round A, and then A becomes red a second time. Before we go on to consider what other colours arise at A, we will observe what becomes of those which arise first. The red, which first appeared at A, spreads itself into a circular ring round A: this ring grows larger, as the water glides down the sides of the bubble; so that the coloured ring glides down the bubble along with the water, till it sinks at last to BC, and there encompasses the bubble. In like manner the blue, which arises at A after the red, spreads itself and descends down the bubble, as the red ring did. The colour which arises next at A, is red a second time; this spreads itself in the same manner, and is succeeded by blue a second time. These are followed by a great variety of colours, which appear successively at A, and spread themselves from thence in this order: Red, yellow, green, blue, purple; then again red, yellow, green, blue, violet; and lastly, red, yellow, white, blue. This last blue colour is succeeded at A by a black spot, which reflects scarce any light: this spot dilates itself, but not into a circular ring as the colours had done; it becomes broader and broader, till the bubble breaks.

A thin plate of water of the same sort with this bubble, but more lasting, may be otherwise procured. If a piece of plane polished glass is placed upon the object-glass of a long telescope, as in (No. 39,) the plane surface of one glass, and the convex one of the other, will touch one another only at a single point; and if the interval between them is filled with water, as the glasses are pressed together, the same colours arise at the point of contact.
contact, and spread themselves in circular rings round it in the same order as in the soap-bubble. If BC (No. 40.) is a section of the plane glass, and DAE a section of the convex one; when they are pressed close together, the thin plate of water that fills the interval between them will have a black spot at A; and this spot will be encompassed with rings of colours, in the same order that they stand in that figure upon the line BC, on each side of A. If the colours are reckoned in the order in which they stand on the plate of water after the black spot appears at A, and we reckon them from the spot A towards the edges of the plate at B and C; then we must call blue the first colour. But if we reckon them in the order in which they arose at A, and spread themselves; then we must begin from B or C, the edges of the plate, and go on towards A, and in this reckoning we must call red the first colour.

If there is no water between the two glasses, then the interval will be filled with air, and this thin plate of air will have the same colours that the plate of water had; with this difference only, that each of the coloured rings is larger in the plate of air than in the plate of water.

When glass is blown very thin at a lamp-furnace, thin plates of it thus formed will exhibit colours; and fo likewise will thin plates of Muscovy-glass. Metals, when they are heated, send out to their surfaces scoria or vitrified parts, which cover the metals in form of a thin skin; and these scoria or thin plates cause colours upon the surface of the metal, such as are made to appear on polished steel by heating it, or on bell-metal by melting it first and then pouring it on the ground to cool in the air.

When the thin plate is denser than the medium that surrounds it, the colours are more vivid than they are when the plate is rarer than that medium.

A thin bubble is a plate of water encompassed with air; where the substance of the plate, which is water, is denser than the air, which is the medium that surrounds it. On the contrary, the plate of air between the two glasses BAC, DAE, (No. 40.) is encompassed with glass; and here the substance of the plate is rarer than that of the circumambient medium; and the colours on the bubble of water are more vivid than those on the thin plate of air.

When thin transparent plates reflect one sort of rays, they transmit the rest.

If the plate of air between the two glasses BAC, DAE, (No. 40.) is viewed by reflected light, the colours of it are those expressed on the upper part of the figure from B to C; but if we look through it, that is, if we view it by transmitted light, or if the transmitted light falls upon a white paper, the colours that we see through the plate, or that fall on the paper, are those expressed on the lower part of the figure. Now, any of the transmitted colours are what would arise from a mixture of all the remaining rays, after those of the reflected colour are separated from the sun's heterogeneous light. Thus, for instance, the fourth reflected colour from the black spot A inclusively is yellow, the transmitted colour is violet. The yellow rays, and some of the orange and green, are reflected here, so that the mixture of the reflected light will be yellow. The mixture of the transmitted light therefore will be violet, or rather such a purple as is not exactly like any of the primary colours; for we observed, that from red rays, violet, and blue, new purples may be produced.

This is the case in some natural bodies, as well as in these transparent artificial plates; for if leaf-gold, which is made thin enough to transmit light, is held against the strong light of the sun's rays, the gold, which is yellow when seen by the reflected light, will be blue when thus seen by transmitted light.

The seventh reflected colour inclusively from the black spot is blue, the seventh transmitted colour is yellow. When the rays which make the blue colour are taken out of the sun's heterogeneous light, the remaining rays will be yellow. Thus it happens likewise in some natural bodies; for an infusion of lignum nephriticum, which is blue when seen by reflected light, is yellow when seen by transmitted light.

The black spot A reflects scarce any light: and as rays of all colours are transmitted there, the transmitted colour is white; the third reflected colour from the black spot inclusively is white. Therefore, since all the rays are reflected there, no colour ought to be seen there, when we look through the plate; and accordingly that part of the plate is black.

Hence we see the reason why, if there be two liquors of full colours in two different glass vessels, supple red and blue; though each is transparent when we look thro' it separately, yet we should not be able to see through both of them together, if one was held behind the other. For if the blue liquor, for instance, is held towards the light, and the red towards the eye; since blue rays pass through the first liquor, and come to the second; and since the second liquor will transmit no blue rays, but only red ones; it follows, that no rays at all can come to the eye.

Indeed some transparent bodies appear of the same colour, whether we see them by reflected or transmitted light. Of this sort is most painted glass. But when this is the case, the coloured rays are reflected from the second surface of the body. Thus, if a piece of painted glass is yellow either when seen by reflected light, or when seen by transmitted light, all the rays but the yellow ones are suppressed as they pass through the glass: of the yellow rays, most are transmitted at the second surface; the few which are reflected from thence will be sufficient to tinge all the light yellow, which is reflected from the first surface. This will be evident from making the body thick, and pitching it on the backside: for by this means the reflected colour will be lost; whereas, if it had been reflected from the first surface, the pitch at the second surface could not have altered it.

The more dense the substance is out of which a thin plate is made, the less is the thickness of the plate where it reflects any certain colour.

The colours are the same whether there is air or water between the two glasses BAC, DAE, (No. 40.) only the coloured circles are smaller in the plate of water than in the plate of air. Thus the yellow, for instance, which is the fourth coloured circle from the black spot, is a less circle, or is nearer to the black spot, when there is a plate of water between the glasses, than when there is a plate...
plate of air between them. But the less the distance from the point of contact $A$, the clearer the glasses are to one another, and consequently the thinner will be the plate that lies between them; consequently that part of a plate of water where this yellow appears, is thinner than that part of a plate of water where the same colour appears. And the same holds good in any other colour. But water is more dense than air; therefore, the more dense the substance is out of which a thin plate is made, the less is the thickness of the plate where it reflects any certain colour.

The fort of colour, which is reflected from any part of a thin plate, depends only upon the thickness of the plate itself in that part: but the same colour will be made less vivid by increasing the density of the medium with which the plate is encompassed.

The colours upon any part of a thin plate of Muscovy glass are the same in fort, whether the plate is dry or wetted with water. Therefore the fort of colour in any part depends not upon the medium that encompasses the plate, but upon the thickness of the plate itself, since the colours are the same when the plate is dry and encompassed with air, or wet and fo encompassed with water. But the same colours are more faint when the plate is wet, than when it is dry; and consequently, the brightness of the colours does depend upon the medium that encompasses the plate; and the denser that medium is, the fainter will be the colours; they are more faint when the plate is covered with water than when it is dry and fo is surrounded with air.

The rays of light have alternate fits of easy reflection and easy transmission, which return at equal intervals.

Let $GF$, (No. 41.) be a beam of homogeneous light consisting all of one sort of rays, as suppose all the rays that compose the beam were red ones. Then, if these rays fall upon a thin plate of air between the two glasses $BAC$, $DAE$, at $A$ there will be a dark spot; and all the rays will be transmitted; round this spot there will be a red ring, where all the rays are reflected; round this red ring there will be a dark ring, where all the rays are transmitted. And if the thicknesses of the plate where all the rays are reflected in the ring nearest to $A$ is called 1, the thickness where the dark ring appears and all the rays are transmitted will be 2. Again, at that part of the plate where the thicknesses is 3, all the rays will be transmitted; at the thicknesses 4, they will be all reflected. And thus alternately, as expressed by the lines in the figure, the rays will be reflected in all parts of the plate where the thicknesses is expressed by any of the uneven numbers 1, 3, 5, 7, 9, &c. and will be transmitted where the thicknesses is expressed by any of the even numbers 2, 4, 6, 8, 10, &c.

Now as the plate is the same in all parts, the cause of this alternate reflection and transmission must be in the rays themselves; and their dispositions to be thus alternately reflected and transmitted, are what we call fits of easy reflection and easy transmission.

The rays that are in a fit of easy reflection penetrate as far as the second surface of the plate. For if the second surface of a thin plate of Muscovy glass is wetted, the colours caused by the alternate reflection grow fainter; whereas if the reflection was made at the first surface, wetting the second could not affect the colours. But since those rays which have passed from the first surface of the plate to the second where the thickness of it is 1, are reflected, and those which have passed from the first surface to the second where the thickness of it is 2, are transmitted; and then again those which have thus passed from one surface to the other, where the thicknesses is 3, are reflected; and those which have passed in the same manner, where the thicknesses is 4, are transmitted; it follows, that the fits of easy reflection and transmission return at equal intervals. So that, if a ray was to be set out from $A$ in the line $AB$, (No. 42.) and was to be in a fit of easy reflection when it had moved from $A$ to $c$, it would be in a fit of easy transmission when it had moved to twice that distance from $A$, or when it was got to $d$: at $e$, or the distance 3 from $A$, it will be in a fit of easy reflection; at $f$, or the distance 4, in a fit of easy transmission; at $g$, or 5, in a fit of easy reflection; at $h$, or 6, in a fit of easy transmission: and thus, in the farther progress of the ray, the same fits will return at equal intervals.

Thus if the thickness of the plate of air, where the rays of any homogeneous colour are all reflected, is equal to $Ac$ or 1, and the rays are in a fit of easy reflection when they come to the second surface of the plate; then, where the thicknesses of the plate is $Ad$ or 2, the rays will be in a fit of easy transmission when they come to the second surface, and consequently will all pass through that surface. Again, where the thicknesses is $Ac$ or 3, the rays, when they come to the second surface, will be in a fit of easy reflection, and will all be reflected; where the thicknesses is $Ad$ or 4, the fit of easy transmission will be returned when the rays come to the second surface, so that all of them will be transmitted. And in like manner, by such fits returning at equal intervals, the rays will be reflected where the thicknesses is expressed by the number 1, 3, 5, 7, 9, &c. and will be transmitted where it is expressed by 2, 4, 6, 8, 10, &c.

When a thin coloured plate is viewed obliquely, the colours of every part in the plate will be altered.

When a bubble of water or a plate of air between two glasses $BAC$, $DAE$, (No. 40.) is viewed obliquely, the coloured rings dilate themselves: and consequently a ring of any one colour, by being dilated, gets into that part of the plate where a ring of some other colour appeared when the plate was viewed directly.

If the plate is denser than the medium that encompasses it, the colours of it, when viewed obliquely, change less than they would if the plate was rarer than the medium that encompasses it.

A bubble of water is a thin plate denser than the air that encompasses it; and a plate of air between the two glasses $BAC$, $DAE$, (No. 48.) is rarer than the glass that encompasses it. Upon viewing each of these thin plates obliquely, the coloured rings on the plate of water dilate less than those on the plate of air. Therefore, since it is by this dilation of the rings that a ring of
one colour gets into a part of the plate where a ring of some other colour appeared when the plate was viewed directly; that is, since it by this dilatation of the rings that the several parts of the plates change their colours; it follows, that any part of a plate of water encompassed with air changes colour less upon being viewed obliquely, than any part of a plate of air encompassed with glass.

When the medium which encompasses a coloured transparent plate is given, the colours change less upon altering the situation of the eye, as the substance is more dense out of which that plate is made.

The matter out of which a bubble of water is made is not so dense as that out of which a bubble of glass is made, and glass is not so dense as the scoria or glassy skin thrown out by metals when they are heated. Now, any of these plates either of water, or glass, or metallic substance, when they are encompassed with the same medium air, will change their colour a little upon being viewed obliquely; but the plate of water changes the most, the plate of glass less than that, and the scoria of metals least of all.

Of the Opakesness, Transparency, and Colours of Natural Bodies.

The opakensness of bodies is owing to the many reflections and refractions which the rays of light suffer within those bodies.

The smallest parts of almost all natural bodies are transparent, as will readily be granted by those who have been used to look through microscopes. A piece of leaf-gold, is transparent if it is held up against the hole of a window-flutter in a dark room; and any other substance, however opaque it may seem in the open air, will appear transparent by the same means, when it is made of a sufficient thinness. Even metals become transparent, if they are dissolved in a proper menstruum, as gold in aqua regia, or silver in aqua fortis; and by being thus dissolved, are reduced to very small particles. But since even in opaque bodies every single particle transmits light, or is transparent, the whole would likewise transmit light, unless the rays, when they are to pass through all the particles which make up the whole, were so turned out of the way by innumerable refractions and reflections, as to be stopped and suppressed in their passage. That this is the reason why bodies that consist of transparent particles should be opaque, is evident; since opaque bodies, when they are reduced to a sufficient thinness, become transparent; for then there will be but few particles lying beyond another for the light to pass through; and as the rays will suffer fewer refractions and reflections, some of them may get through a thin plate, though all of them would be suppressed in a thicker mass of the same substance.

The medium, with which the pores of opaque bodies are filled, is not of the same density with the particles of those bodies.

Bodies consist of transparent particles, and their opakensness is owing to the many refractions and reflections which the light suffers within them. Now, if the interfaces between the particles of any body were filled with a medium of the same density with the particles, the light would neither be refracted nor reflected as it passed out of the particles into the interfaces and out of the interfaces into the pores, but would pass through the body, and the body would be transparent. Consequently, in an opaque body, where the light is suppressed by the refractions and reflections which it suffers, the particles that compose the body, and the medium that fills the pores or interfaces between the particles, must be of different densities.

Hence we may see the reason why paper, when it has been dipped in water or oil, is more transparent than when it is dry. For when the paper is thoroughly wetted with water or oil, the pores of it are filled with a medium that is nearly of the same density with its particles. On the contrary, though oil of turpentine and water are both of them transparent when they are separate; yet if they are shaken together so as to mix but imperfectly, the mixture becomes much less transparent, because the parts of each fluid are separated from one another, and those of the other fluid, which are of a different density, get in between them.

The parts of bodies, and their interfaces, must not be less than of a certain definite bigness to render them opaque and coloured.

The most opaque bodies become transparent when their particles are subtilly divided; as metals, such as gold or silver, which are opaque in large masses, become transparent when the former is dissolved in aqua regia, and the latter in aqua fortis. And we observed, that at the top of a bubble of water, where the water is extremely thin, there is a black spot, which reflects scarce any light at all; though the water is encompassed with air, which is a medium of a different density. Consequently, if the diameter of the particles of which any natural substance consists was no greater than the thickness of the bubble, where it reflects no light, but transmits all, such a body would be transparent, notwithstanding the interfaces that are between its particles were filled with a medium the density of which is different from theirs.

In like manner, we observed, that when a thin plate of air lies between two pieces of glass BAC, DAE, (No 40.) there is a dark spot, which reflects no light, and transmits all, not only at the point A where the glasses touch one another, but also round that point to some distance where the glasses are very near to one another. From hence we may conclude, that though the particles of any natural substance were as dense as glass, and the medium which fills their interfaces was as rare as air; yet if these interfaces were no bigger than the interval between the two glasses BAC, DAE, at that place where all light is transmitted, such a body would be transparent.

The transparency of water seems to be owing to the capes here mentioned, to the smallness of its parts, or of its pores; or of both. For we are sure that the pores of water are filled with air, because the air may be drawn out from the water in an air-pump; and consequently, as the pores are filled with a medium of a different density from the parts, the mixture ought to be opaque, like such a mixture of water and oil of turpentine as was mentioned above; But the smallness either of the parts,
or of the interfiles, or of both, will prevent the mixture from being opaque.

Since therefore all bodies will be transparent, if either their parts or their interfiles are too small, it follows that the parts, and likewise the pores, of such bodies as are not transparent but opaque and coloured, must not be less than of a certain and determinate bigness.

The colours of natural bodies depend upon the size of their particles.

Different parts of thin transparent plates, according to the different bignesses of them, are of different colours. Now if any part of such a thin plate of glass, for instance, where it appears of one uniform colour, should be split into threads, or broken into small particles, all these particles would make a heap of powder of the same colour. And the small particles of natural bodies, since they are transparent, like so many fragments of a thin plate, must exhibit colours in the same manner.

The parts of bodies, on which their colours depend, are much denser than the medium which fills their pores.

For where the transparent plate or particle consists of a rarer substance than the medium that encompasses it, the colours are less vivid than those of natural bodies commonly are. For this reason it is that the colours of silks or cloths, when they are wetted with oil or water, become more faint; because these liquors are more nearly of the same density with the particles, than the medium is which fills the interfiles when they are dry. Besides, the colours upon a transparent plate change very sensibly, unless the plate consists of a substance much denser than the medium that encompasses it; but most natural bodies are of the same colour in whatever position of the eye they are viewed. Therefore their transparent particles, upon which their colours depend, are much denser than the medium which encompasses those particles or fills the interfiles between them.

Nor is it otherwise even in those bodies which do change colour upon being viewed obliquely, such as changeable silks, or the feathers of a peacock's tail or of a pigeon's neck. For this change of colour, upon the situation of the eye being changed, is no reason for concluding that the medium which fills the interfiles or pores is more nearly of the same density with the particles, upon which the colours depend, in these bodies than in others; since the change of colour is plainly owing to our seeing a different part of the body in different positions of the eye. Thus, in changeable silks, the warp is of one colour, and the woof of another; and in one position of the eye more of the warp is seen, and in another position of it more of the woof is seen. In like manner, if a pigeon's neck appears blue in one position of the eye, and crimson in another, it is because in these different positions we see different parts of the same feathers.

We cannot from the colour of a body make any conjecture about the size of the particles upon which its colours depend.

Suppose, from the appearance of the colour in any yellow body, that we had determined its yellow to be of the same sort with that which is next to the black spot in a plate of air, or water, or glass. The thickness of a plate, where it appears of this colour, is different according to the different density of the substance out of which that plate is made; the thicknesses of a plate of air where it appears of this colour, is greater than that of a plate of water were it appears of the same colour, and much greater fill than that of a plate of glass. Suppose therefore farther, that we were able to determine exactly what is the thickness of a plate of air or water or glass, where each of them is tinged with the same yellow colour that any natural body exhibits; yet we cannot determine whether the diameter of the particles, upon which this body's colour depends, is equal to the thickness of the plate of air, or of water, or of glass, unless we could first determine whether the density of those particles is equal to the density of air, or to that of water, or to that of glass: since the particles must be larger, if their density is equal to the density of air, than if it is equal to the density of water; and larger, if it is equal to that of water than if it is equal to that of glass. And indeed we have good reason to conclude, that the density of the parts, upon which the colours of natural bodies depend, is greater even than that of glass; and consequently that the diameter of those parts is much less than the thickness of a plate of glass, where it appears of the same colour with the body. For, upon being viewed obliquely, thin plates of glass change colour, whereas natural bodies do not: and the colour of natural bodies is made more unchangeable than that of thin plates of glass, by their particles being more dense than glass.

Of the Rainbow.

When the rays of the sun fall upon a drop of rain and enter into it, some of them, after one reflection and two refractions, may come to the eye of a spectator who has his back towards the sun and his face towards the drop.

If XY (No. 43.) is a drop of rain, and the sun shines upon it in any lines $s_f$, $d_s$, $a_r$, &c. most of the rays will enter into the drop; some few of them only will be reflected from the first surface; those rays, which are reflected from thence, do not come under our present consideration, because they are never refracted at all. The greatest part of the rays then enter the drop, and those passing on to the second surface will most of them be transmitted through the drop; but neither do those rays which are thus transmitted fall under our present consideration, since they are not reflected. For the rays, which are described in the proposition, are such as are twice refracted and once reflected. However, at the second surface, or hinder part of the drop, at $p_g$ some few rays will be reflected, whilst the rays are transmitted; those rays proceed in some such lines as $v_r$, $q_t$, and coming out of the drop in the lines $r_v$, $q_t$, may fall upon the eye of a spectator, who is placed any where in those lines, with his face towards the drop, and consequently with his back towards the sun, which is supposed to shine upon the drop in the lines $s_f$, $d_s$, $a_r$, &c. These rays are twice refracted, and once reflected: they are refracted, when they pass out of the air into the drop; they are reflected from the second surface, and are refracted again, when they pass out of the drop into the air.

When
When rays of light reflected from a drop of rain come to the eye, those are called effectual which are able to excite a sensation.

When rays of light come out of a drop of rain, they will not be effectual, unless they are parallel and contiguous.

There are but few rays that can come to the eye at all; for the greatest part of those which enter the drop sy (No. 43.) between x and a, pass out of the drop through the hinder surface pg; only few are reflected from thence and come out through the nearer surface between a and y. Now such rays as emerge, or come out of the drop, between a and y, will be ineffectual, unless they are parallel to one another, as ru and qt are; because such rays as come out diverging from one another, will be so far at variance when they come to the eye, that all of them cannot enter the pupil; and the very few that can enter it will not be sufficient to excite any sensation. But even rays, which are parallel, as rv, qt, will not be effectual, unless there are several of them contiguous or very near to one another. The two rays ru and qt alone will not be perceived, though both of them enter the eye; for so very few rays are not sufficient to excite a sensation.

When rays of light come out of a drop of rain after one reflection, these will be effectual which are reflected from the same point, and which entered the drop near to one another.

Any rays, as sb and cd, (No. 44.) when they have passed out of the air into a drop of water, will be refracted towards the perpendiculars bl, dl; and as the ray sb falls farther from the axis sa than the ray cd, sb will be more refracted than cd; so that these rays, though parallel to one another at their incidence, may describe the lines be and de after refraction, and be both of them refracted from one and the same point e. Now all rays which are thus reflected from one and the same point, when they have described the lines eg, ef, and after refraction emerge at f and g, will be so refracted, when they pass out of the drop into the air, as to describe the lines fg, gi, parallel to one another. If these rays were to return from e in the lines eb, ed, and were to emerge at b and d, they would be refracted into the lines of their incidence bs, dc. But if these rays, instead of being returned in the lines eb, ed, are reflected from the same point e in the lines eg, ef, the lines of refraction eg and ef will be inclined both to one another and to the surface of the drop; just as much as the lines eb and ed are. First eb and eg make just the same angle with the surface of the drop; for the angle bex, which eb makes with the surface of the drop, is the complement of incidence; and the angle gey, which eg makes with the surface, is the complement of reflection; and these two are equal to one another. In the same manner we might prove that ed and ef make equal angles with the surface of the drop. Secondly, the angle bed is equal to the angle seg, or the reflected rays eg, ef, and the incident rays be, de, are equally inclined to each other. For the angle of incidence bel is equal to the angle of reflection gel, and the angle of incidence del is equal to the angle of reflection fed; consequently the difference between the angles of incidence is equal to the difference between the angles of reflection, or bel—del = gel—fed, or bed = ges. Since therefore either the lines eg, ef, or the lines eb, ed, are equally inclined both to one another and to the surface of the drop; the rays will be refracted in the same manner, whether they were to return in the lines eb, ed, or are reflected in the lines eg, ef. But if they were to return in the lines eb, ed, the refraction, when they emerge at b and d, would make them parallel. Therefore, if they are reflected from one and the same point e in the lines eg, ef, the refraction, when they emerge at g and f, will likewise make them parallel.

But though such rays, as are reflected from the same point in the hinder part of a drop of rain, are parallel to one another, when they emerge, and to have one condition that is requisite towards making them effectual; yet there is another condition necessary; for rays, that are effectual, must be contiguous, as well as parallel. And though rays, which enter the drop in different places, may be parallel when they emerge, those only will be contiguous which enter it nearly at the same place.

Let sy, (No. 43.) be a drop of rain, ag the axis or diameter of the drop, and sa a ray of light that comes from the fun and enters the drop at the point a. This ray sa, because it is perpendicular to both the surfaces, will pass straight through the drop in the line agb without being refracted; but any collateral rays that fall about sb, as they pass through the drop, will be made to converge to their axis, and passing out at n will meet the axis at b; rays which fall farther from the axis than sb, such as those which fall about sc, will likewise be made to converge; but then their focus will be nearer to the drop than b. Suppose therefore i to be the focus to which the rays that fall about se will converge, any ray sc, when it has described the line eo within the drop, and is tending to the focus i, will pass out of the drop at the point o. The rays that fall upon the drop about sd, more remote still from the axis, will converge to a focus still nearer than i, as suppose at k. These rays therefore go out of the drop at p. The rays, that fall still more remote from the axis, as se, will converge to a focus nearer than k, as suppose at l; and the ray se, when it has described the line eo within the drop, and is tending to the focus l, will pass out at the point o. The rays, that fall still more remote from the axis, will converge to a focus still nearer. Thus the ray sf will after refraction converge to a focus at m, which is nearer than l; and having described the line fn within the drop, it will pass out at the point n. Now here we may observe, that as any rays sb or sc, fall farther above the axis sa, the points n, or o, where they pass out behind the drop, will be farther above g; or that, as the incident ray rises from the axis sa, the arc gno increases, till we come to some ray sd, which passes out of the drop at p; and this is the highest point where any ray that falls upon the quadrant or quarter ax can pass out: for any rays se, or sf, that fall higher than sd, will not pass out in any point above p, but at the points o, or n, which are below it. Consequentially, though the arc gno increases, whilst the distance of the incident ray from the axis sa increases, till we come to the ray sd; yet afterwards, the higher the
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rays fall above the axis sa, this arc ong will decrease.

We have hitherto spoken of the points on the hinder part of the drop, where the rays pass out of it; but this was for the sake of determining the points from whence those rays are reflected, which do not pass out behind the drop. For, in explaining the rainbow, we have no farther reason to consider those rays which go through the drop; since they can never come to the eye of a spectator placed any where in the lines rv or qr with his face towards the drop. Now, as there are many rays which pass out of the drop between g and p, so from some rays will be reflected from thence; and consequently the several points between g and p, which are the points where some of the rays pass out of the drop, are likewise the points of reflection for the rest which do not pass out. Therefore, in respect of those rays which are reflected, we may call gp the arc of reflection; and may say, that this arc of reflection increases, as the distance of the incident ray from the axis sa increases, till we come to the ray sd; the arc of reflection is gn for the ray sb, it is go for the ray sc, and gp for the ray sd. But after this, as the distance of the incident ray from the axis sa increases, the arc of reflection decreases; for sg less than pg is the arc of reflection for the ray se, and ng is the arc of reflection for the ray sf.

From hence it is obvious, that some one ray, which falls above sd, may be reflected from the same point with some other ray which falls below sd. Thus, for instance, the ray sb will be reflected from the point n, and the ray sf will be reflected from the same point; and consequently, when the reflected rays nr, nj are refracted as they pass out of the drop at r and q, they will be parallel, by what has been shewn in the former part of this proposition. But since the intermediate rays, which enter the drop between sf and sb, are not reflected from the same point n, these two rays alone will be parallel to one another when they come out of the drop, and the intermediate rays will not be parallel to them. And consequently these rays rv, qt, though they are parallel after they emerge at r and q, will not be contiguous, and for that reason will not be effectual; the ray sd is reflected from p, which has been shewn to be the limit of the arc of reflection; such rays, as fall just above sd, and just below sd, will be reflected from nearly the same point p, as appears from what has been already shewn. These rays therefore will be parallel, because they are reflected from the same point p; and they will likewise be contiguous, because they all of them enter the drop at one and the same place very near to d. Consequently, such rays as enter the drop at d, and are reflected from p the limit of the arc of reflection, will be effectual; since, when they emerge at the fore part of the drop between a and y, they will be both parallel and contiguous.

If we can make out hereafter that the rainbow is produced by the rays of the sun which are thus reflected from drops of rain as they fall whilst the sun shines upon them, this proposition may serve to shew us, that this appearance is not produced by any rays that fall upon any part and are reflected from any part of those drops: since this appearance cannot be produced by any rays but those which are effectual; and effectual rays must all...
g as upon a centre, till they became parallel to $ab$ the incidental ray. But if either of these lines or rays were refracted so much from $g$ as to become parallel to $ab$, the ray so much refracted would, after emergence, make no angle with $ab$, because it would be parallel to it. And consequently that ray which is most turned round upon the point $g$, or that ray which is most refrangible, will after emergence be nearest parallel to the incident ray, or will make the least angle with it. The same may be proved of all other rays emerging parallel to $gi$ and $gp$ respectively, or of all effectual rays; tho' which are most refrangible, will after emergence make a less angle with the incident rays, than those do which are least refrangible.

But since the effectual rays of different colours make different angles with $ab$ at their emergence, they will be separated from one another: so that if the eye was placed in the beam $gh$, it would receive only rays of one colour from the drop $xagy$; and if it was placed in the beam $fgnp$, it would receive only rays of some other colour.

The angle $sgh$, which the least refrangible or red rays make with the incident ones, when they emerge so as to be effectual, is found by calculation to be 42 degrees 2 minutes. And the angle $sgi$, which the most refrangible rays make with the incident ones, when they emerge so as to be effectual, is found to be 40 degrees 17 minutes.

The rays, which have the intermediate degrees of refrangibility, make with the incident ones intermediate angles between 42 degrees 2 minutes and 40 degrees 17 minutes.

If a line is supposed to be drawn from the centre of the sun through the eye of the spectator, the angle which any effectual ray, after two refractions and one reflection, makes with the incident ray, will be equal to the angle which it makes with that line.

Let the eye of the spectator be at $i$, (No. 44.) and let $qi$ be the line supposed to be drawn from the centre of the sun through the eye of the spectator; the angle $qis$, which any effectual ray makes with this line, will be equal to the angle $ski$, which the same ray makes with the incident $xay$ or $sk$. If $zh$ is a ray coming from the centre of the sun, then since $qi$ is supposed to be drawn from the same point, these two lines, upon account of the remoteness of the point from whence they are drawn, may be looked upon as parallel to one another. But the right line $ki$ crossing these two parallel lines will make the alternate angles equal. Eucl. b. i. prop. 29. Therefore $kit$ or $git$ is equal to $ski$.

When the sun shines upon the drops of rain as they are falling; the rays that come from those drops to the eye of a spectator, after one reflection and two refractions, produce the primary rainbow.

If the sun shines upon the rain as it falls, there are commonly seen two bows, as AFB, CHD, (No. 46.) or if the cloud and rain does not reach over that whole side of the sky where the bows appear, then a part of one or of both bows is seen in that place where the rain falls. Of these two bows, the innermost AFB is the more vivid of the two, and this is called the primary bow. The outer part TFY of the primary bow is red, the inner part VEX is violet; the intermediate parts, reckoning from the red to the violet, are orange, yellow, green, blue, and indigo. Suppose the spectator's eye to be at $O$, and let LOP be an imaginary line drawn from the centre of the sun through the eye of the spectator: If a beam of light $S$ coming from the sun falls upon any drop $F$; and the rays that emerge at $F$ in the line $FO$, so as to be effectual, make an angle $FOP$ of 42 degrees 2 minutes with the line $LP$; then these effectual rays make an angle of 42 degrees 2 minutes with the incident rays, by the preceding proposition, and consequently these rays will be red, so that the drop $F$ will appear red. All the other rays, which emerge at $F$, and would be effectual if they fell upon the eye, are refracted more than the red ones, and consequently will pass above the eye. If a beam of light $S$ falls upon the drop $E$; and the rays that emerge at $E$ in the line $EO$, so as to be effectual, make an angle $EOP$ of 40 degrees 17 minutes with the line $LP$; then these effectual rays make likewise an angle of 40 degrees 17 minutes with the incident rays, and the drop $E$ will appear of a violet colour. All the other rays, which emerge at $E$, and would be effectual if they came to the eye, are refracted less than the violet ones, and therefore pass below the eye. The intermediate drops between $F$ and $E$ will for the same reasons be of the intermediate colours.

Thus we have shewn why a set of drops from $F$ to $E$, as they are falling, should appear of the primary colours, red, orange, yellow, green, blue, and indigo, and violet. It is not necessary that the several drops, which produce these colours, should all of them fall at exactly the same distance from the eye. The angle $FOP$, for instance, is the same whether the distance of the drop from the eye is $OF$, or whether it is in any other part of the line $OF$ something nearer to the eye. And whilst the angle $FOP$ is the same, the angle made by the emerging and incident rays, and consequently the colour of the drop, will be the same. This is equally true of any other drop. So that although in the figure the drops $F$ and $E$ are represented as falling perpendicularly one under the other, yet this is not necessary in order to produce the bow.

But the coloured line $FE$, which we have already accounted for, is only the breadth of the bow. It still remains to be shewn, why not only the drop $F$ should appear red, but why all the other drops quite from $A$ to $B$ in the arc ATFYB should appear of the same colour. Now it is evident, that where-ever a drop of rain is placed, if the angle which the effectual rays make with the line $LP$ is equal to the angle $FOP$, that is, if the angle which the effectual rays make with the incident rays is 42 degrees 2 minutes, any of those drops will be red, for the same reason that the drop $F$ is of this colour.

If FOP was to turn round upon the line OP, so that one end of this line should always be at the eye, and the other be at P opposite to the sun; such a motion of this figure would be like that of a pair of compasses turning round upon one of the legs OP with the opening FOP. In this revolution the drop F would describe a circle, P would be the centre, and ATFYB would be an arc in this circle. Now since, in this motion of the line and drop OP, the angle made by FO with OP, that is, the angle FOP, continues the same; if the sun was to shine upon this drop as it revolves, the effectual rays would make the same angle
The primary rainbow is never a greater arc than a semicircle.

Since the line LOP is drawn from the sun through the eye of the spectator, and since P (No. 46.) is the centre of the rainbow; it follows, that the centre of the rainbow is always opposite to the sun. The angle FOP is an angle of 42 degrees 2 minutes, as was observed, or F the highest part of the bow is 42 degrees 2 minutes from P the centre of it. If the sun is more than 42 degrees 2 minutes high, P the centre of the rainbow, which is opposite to the sun, will be more than 42 degrees 2 minutes below the horizon; and consequently F the top of the bow, which is only 42 degrees 2 minutes from P, will be below the horizon; that is, when the sun is more than 42 degrees 2 minutes high, no primary rainbow will be seen. If the sun is something less than 42 degrees 2 minutes high, then P will be something less than 42 degrees 2 minutes from P, will be just above the horizon; that is, a small part of the bow at this height of the sun will appear close to the ground opposite to the sun. If the sun is 20 degrees high, then P will be 20 degrees below the horizon; and F the top of the bow, being 42 degrees 2 minutes from P, will be 22 degrees 2 minutes above the horizon; therefore, at this height of the sun, the bow will be an arc of a circle whose centre is below the horizon; and consequently that arc of the circle, which is above the horizon, or the bow, will be less than a semicircle. If the sun is in the horizon, then P, the centre of the bow, will be in the opposite part of the horizon; F, the top of the bow, will be 42 degrees 2 minutes above the horizon; and the bow itself, because the horizon passes thro' the centre of it, will be a semicircle. More than a semicircle can never appear; because if the bow was more than a semicircle, P the centre of it must be above the horizon; but P is always opposite to the sun, therefore P cannot be above the horizon, unless the sun is below it; and when the sun is set, or is below the horizon, it cannot shine upon the drops of rain, as they fall; and consequently, when the sun is below the horizon, no bow at all can be seen. The rays of the sun fall upon a drop of rain, some of them, after two refractions and two reflections, may come to the eye of a spectator, who has his back towards the sun and his face towards the drop.

If bgw, (No. 45.) is a drop of rain, and parallel rays coming from the sun, as xo, yw, fall upon the lower part of it, they will be refracted towards the perpendiculars vh, wa, as they enter into it, and will describe some such lines as vh, wa. At h and i great part of these rays will pass out of the drop; but some of them will be reflected from thence in the lines hs, ig. At f and g again, great part of the rays, that were reflected thither, will pass out of the drop. But these rays will not come to the eye of a spectator at o. However, here again all the rays will not pass out; but some few will be reflected from f and g, in some such lines as fcl, gh; and these, when they emerge out of the drop of water into the air at a and d, will be refracted from the perpendiculars, and, describing the lines dt, be, may come to the eye of a spectator who has his back towards the sun and his face towards the drop.

Those rays, which are parallel to one another after they have been once refracted and once reflected in a drop of rain, will be effective when they emerge after two refractions and two reflections.

No rays can be effective, unless they are contiguous, and parallel. From what was said, it appears, that when rays come out of a drop of rain contiguous to one another, either after one or after two reflections, they must enter the drop nearly at one and the same place. And if such rays as are contiguous are parallel after the first reflection, they will emerge parallel, and therefore will be effective. Let xo and yw be contiguous rays which come from the sun, and are parallel to one another when they fall upon the lower part of the drop bgw, (No. 45.) suppose these rays to be refracted at v and w, and to be reflected at h and i; if they are parallel to one another, as hs, gi, after this first reflection, then, after they are reflected a second time from f and g, and refracted a second time as they emerge at d and b, they will go out of the drop parallel to one another in the lines at and bo, and will therefore be effective.

The rays xo, yw, are refracted towards the perpendiculars vh, wa, when they enter the drop, and will be made to converge. As these rays are very oblique, their focus will not be far from the surface vw. If this focus is at k, the rays, after they have passed the focus, will diverge from thence in the directions kh, ki; and if ki is the principal focal distance of the concave reflecting surface hi, the reflected rays hs, ig, will be parallel. These rays hs, ig, are reflected again from the concave surface fg, and will meet in a focus at e, so that ge will be the principal focal distance of this reflecting surface fg. And because hi and fg are parts of the same sphere, the principal focal distances ge and ki will be equal to one another. When the rays have passed the focus e, they will diverge from thence in the directions ed, eb; and we are to shew, that, when they emerge at d and b, and are refracted there, they will become parallel.

Now if the rays ek, ek, when they have met at k, were to be turned back again in the directions kw, kw, and were to emerge at w and w, they would be refracted into the lines of their incidence zu, zu, and therefore would be parallel. But since ge is equal to ik, as has already been shewn, the
When rays that are effectual emerge from a drop of rain after two reflections and two refractions, those which are most refrangible will at their emergence make a greater angle with the incident rays than those do which are least refrangible; and by this means the rays of different colours will be separated from one another.

If rays of different colours, which are differently refrangible, emerge at any point B, (No. 45.) these rays will not be all of them equally refracted from the perpendicular. Thus, if Bo is a red ray, which is of all others the least refrangible, and BM is a violet ray, which is of all others the most refrangible; when these two rays emerge at B, the violet ray will be refracted more from the perpendicular BX than the red ray, and the refracted angle XBM will be greater than the refracted angle XBO. From hence it follows, that these two rays, after emergence, will diverge from one another. In like manner, the rays that emerge at D will diverge from one another; a red ray will emerge in the line DP, a violet ray in the line DT. So that though all the effectual red rays of the beam BDMP are parallel to one another, and all the effectual red rays of the beam BDOP are likewise parallel to one another, yet the violet rays will not be parallel to the red ones, but the violet beam will diverge from the red beam. Thus the rays of different colours will be separated from one another.

This will appear farther, if we consider what the proposition affirms, That any violet or most refrangible ray will make a greater angle with the incident rays, than any red or least refrangible ray makes with the same incident rays. Thus if YW is an incident ray, BM a violet ray emerging from the point B, and BO a red ray emerging from the same point; the angle which the violet ray makes with the incident one is YRM, and that which the red ray makes with it is YRO. Now YRM is a greater angle than YRO. For in the triangle BRS the internal angle BRS is less than BSY the external angle at the base. Euc. b. I. prop. 16.

But YRM is the complement of BRS or of BSY to two right ones, and YRO is the complement of BSY to two right ones. Therefore, since BSY is less than BSY, the complement of BSY to two right angles will be greater than the complement of BSY to two right angles; or YRM will be greater than YRO.

Or otherwise: Both the rays BO and BM, when they are refracted in passing out of the drop at B, are turned round upon the point B from the perpendicular BX. Now either of these lines BO or BM might be turned round in this manner, till it made a right angle with YW. Consequently, that ray which is most turned round upon B, or which is most refracted, will make an angle with YW that will be nearer to a right one than that ray makes with it which is least turned round upon B, or which is least refracted. Therefore that ray which is most refracted will make a greater angle with the incident ray than that which is least refracted.

But since the emerging rays, as they are differently refrangible, make different angles with the same incident ray YW, the refraction which they suffer at emergence will separate them from one another.

The angle YMR, which the most refrangible or violet rays make with the incident ones, is found by calculation to be 54 degrees 7 minutes; and the angle YRO, which the least refrangible or red rays make with the incident ones, is found to be 50 degrees 57 minutes: the angles, which the rays of the intermediate colours, indigo, blue, green, yellow, and orange, make with the incident rays, are intermediate angles between 54 degrees 7 minutes and 50 degrees 57 minutes.

If a line is supposed to be drawn from the centre of the sun through the eye of the spectator; the angle, which, after two refractions and two reflections, any effectual ray makes with the incident ray, will be equal to the angle which it makes with that line.

If YW, (No. 45.) is an incident ray, BO an effectual ray, and QN a line drawn from the centre of the sun through the eye of the spectator; the angle YNO, which the effectual ray makes with the incident ray, is equal to SON the angle which the same effectual ray makes with the line QN. For YW and QN, considered as drawn from the centre of the sun, are parallel; BO crosses them, and consequently makes the alternate angles YNO, SON, equal to one another. Euc. b. I. prop. 29.

When the sun shines upon the drops of rain as they are falling; the rays that come from these drops to the eye of a spectator, after two refractions and two reflections, produce the secondary rainbow.

The secondary rainbow is the outermost CHD, No. 46. When the sun shines upon a drop of rain H; and the rays HO, which emerge at H as to be effectual, make an angle HOP of 54 degrees 7 minutes with LOP a line drawn from the sun through the eye of the spectator; the same effectual rays will make likewise an angle of 54 degrees 7 minutes with the incident rays S, and the rays which emerge at this angle are violet ones, by what was observed above. Therefore, if the spectator's eye is at O, none but violet rays will enter it; for as all the other rays make a less angle with OP, they will fall above the spectator's eye. In like manner, if the effectual rays that emerge from the drop G make an angle of 50 degrees 57 minutes with the line OP, they will likewise make the same angle with the incident rays S; and consequently, from the drop G to the spectator's eye at O, no rays will come but red ones; for all the other rays, making a greater angle with the line OP, will fall below the eye at O. For the same reason, the rays emerging from the intermediate drops between H and G, and coming to the spectator's eye at O, will emerge at intermediate angles, and therefore will have the intermediate colours. Thus, if there are seven drops from H to G inclusively, their colours will be violet, indigo, blue, green, yellow, orange and red. This coloured line is the breadth of the secondary rainbow.

Now, if HOP was to turn round upon the line OP, like a pair of compasses upon one of the legs OP with the opening HOP, it is plain from the supposition, that, in such a revolution of the drop H, the angle HOP would be the same.
fame, and consequently the emerging rays would make the same angle with the incident ones. But in such a revolution the drop would describe a circle of which P would be the centre and CNHRD an arc. Consequently, since, when the drop is at N, or at R, or any where else in that arc, the emerging rays make the same angle with the incident ones as when the drop is at H, the colour of the drop will be the same to an eye placed at O, whether the drop is at N, or at H, or at R, or any where else in that arc. Now, though the drop does not thus turn round as it falls, and does not pass through the several parts of this arc, yet, since there are drops of rain falling every where at the same time, when one drop is at H, there will be another at R, another at N, and others in all parts of the arc; and these drops will all of them be violet-coloured, for the same reason that the drop H would have been of this colour if it had been in any of those places. In like manner, as the drop G is red when it is at C, it would likewise be red in any part of the arc CWGQD; and so will any other drop, when, as it is falling, it comes to any part of that arc. Thus as the sun shines upon the rain, whilst it falls, there will be two arcs produced, a violet coloured one CNHRD, and a red one CWGQD; and for the same reason the intermediate space between these two arcs will be filled up with arcs of the intermediate colours. All these arcs together make up the secondary rainbow.

The colours of the secondary rainbow are fainter than those of the primary rainbow; and are ranged in the contrary order.

The primary rainbow is produced by such rays as have been only once reflected; the secondary rainbow is produced by such rays as have been twice reflected. But at every reflection some rays pass out of the drop of rain without being reflected; so that the oftener the rays are reflected, the fewer of them are left. Therefore the colours of the secondary bow are produced by fewer rays, and consequent-

OPTIMATES, in Roman antiquity, were, according to Tully, the best citizens, who defined their actions might be approved of by the better sort; and the populares, those who, out of a thirst of vain-glory, did not consider so much what was right, as what would please the populace.

OPUNTIA, in botany. See Cactus.

OR, in heraldry, denotes yellow, or gold colour. See Colour and Metal.

In the coats of noblemen, it is blazoned topaz; and in those of sovereign princes, fol.

It is represented in engraving by small points or dots, scattered all over the field or bearing. See Pl. 134. fig. 5.

ORACLE, among the heathens, was the answer which the gods were supposed to give to those who consulted them upon any affair of importance; it is also used for the god who it was thought gave the answer, and the place where it was given.

The credit of oracles was so great, that in all doubts and disputes their determinations were held sacred and inviolable: whence vast numbers flocked to them for advice about the management of their affairs; and no business of any consequence was undertaken, scarce any

ly will be fainter, than the colours of the primary bow.

In the primary bow, reckoning from the outside of it, the colours are ranged in this order; red, orange, yellow, green, blue, indigo, violet. In the secondary bow, reckoning from the outside, the colours are violet, indigo, blue, green, yellow, orange, red. So that the red, which is the outermost or highest colour in the primary bow, is the innermost or lowest colour in the secondary one.

Now the violet rays, when they emerge so as to be effective after one reflection, make a less angle with the incident rays than the red ones; consequently the violet rays make a less angle with the lines OP (No. 46.) than the red ones. But in the primary rainbow the rays are only once reflected, and the angle which the actual rays make with OP is the distance of the coloured drop from P the centre of the bow. Therefore the violet drops or violet arc in the primary bow will be nearer to the centre of the bow, than the red drops or red arc; that is, the innermost colour in the primary bow will be violet, and the outermost colour will be red. And, for the same reason, through the whole primary bow, every colour will be nearer to the centre P, as the rays of that colour are more refrangible.

But the violet rays, when they emerge so as to be effective after two reflections, make a greater angle with the incident rays than the red ones; consequently the violet rays will make a greater angle with the line OP, than the red ones. But in the secondary rainbow the rays are twice reflected, and the angle which the actual rays make with OP is the distance of the coloured drop from P the centre of the bow. Therefore the violet drops or violet arc in the secondary bow will be farther from the centre of the bow than the red drops or red arc; that is, the outermost colour in the secondary bow will be violet, and the innermost colour will be red. And, for the same reason, the whole secondary bow, every colour will be farther from the centre P, as the rays of that colour are more refrangible.

ORA

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ORATORY. See Rhetoric.

ORATORIO, in the Italian music, a sort of sacred drama of dialogues; containing recitatives, duettos, trios, ritornelli, chorufes, &c.

The subjects of these pieces are usually taken from the Scriptures, or from the life of some saint, &c.

The music for the oratorio should be in the finest taste, and best chosen strains. These oratorios are greatly used at Rome, in time of lent; and of late, in England.

ORATORY. See Rhetoric.

Oratory, among the Romanists, an closet or like apartment near a bed-chamber, furnished with an altar, crucifix, &c. for private devotion.

ORB, in astronomy, &c. denotes an hollow globe or sphere.

ORBICULARIS, in anatomy. See Anatomy, p. 306.

ORBIS, in ichthyology, a name given to two species of ostracion, nearly as broad as long, and covered with spines. See Ostracion.

ORBIS MAGNUS, in astronomy, denotes the earth’s orbit, in its annual revolution round the sun.

ORBIS, in astronomy, the path of a planet or comet, or the curve that it describes in its revolution round its central body: thus the earth’s orbit is the curve which it describes in its annual course, and usually called the eccliptic. See Astronomy.

ORCADIEN, ORKNEY-ISHANDS. See Orkney.

ORCHARD, a plantation of fruit-trees. See Garden-ING.

ORCHESTRA, in the ancient theatres, a place in the form of a semi-circle, where the dancing was performed.

In the Greek theatres, the orchestra made part of the stage; but, among the Romans, it answered nearly to our pit; only that in it were disposed the seats for the patroners, magnificates, vulgares, and other persons of distinction.

ORCHIS, in botany, a genus of the gynandria diandria class. The nectarium is shaped like a horn behind the flower. There are 32 species, 12 of them natives of Britain. The root of the morio, or female foal-foanes, has been celebrated as an aphrodisiac, but without any solid foundation.

ORDER, in architecture, is a system of the several members, ornaments, and proportions of columns and pilasters; or a regular arrangement of the projecting parts of a building, especially the column, so as to form one beautiful whole. See Architecture.

ORDER is also used for a division or class of any thing: thus, the tribe of animals called birds is subdivided into orders. See Natural History, and Botany.

Holy orders, a character peculiar to ecclesiastics, whereby they are set apart for the ministry. See Ordination.

Military orders, are companies of knights, instituted by kings and princes; either for defence of the faith, or to confer marks of honour, and make distinctions among their subjects.

Religious orders, are congregations or societies of monastics, living under the same superior, in the same manner, and wearing the same habit.

ORDINAL, a book containing the order or manner of performing divine service.

ORDINANCE, or Ordonnance, a law, statute, or command of a sovereign or superior: thus the acts of parliament are sometimes termed ordinances of parliament.

ORDINARY, in civil law, is any judge invested with authority to take cognizance of causes in his own right, and not by deputation.

ORDINARY, or honourable Ordinary, in heraldry, a denomination given to certain charges properly belonging to that art. The honourable ordnaries are ten in number; viz. the chief, pale, bend, fesse, bar, crois, falter, chevron, bordure, and orle. For which see the articles Chief, Pale, &c.

ORDINATES. See Conic Sections.

ORDINATION, the act of conferring holy orders, or of initiating a person into the priesthood by prayer—and the laying on of hands.

ORDINANCE, a general name for all sorts of great guns used in war. See Gunery.

Office of Ordinance, an office kept within the tower of London, which superintends and dispenses of all the arms, instruments, and utensils of war, both by sea and land,
OREGRUND, a port-town of Sweden, in the province OREBRO, the capital of the province of Nericia, in Sweden: E. long. 15°, N. lat. 59° 30'.

ORE, in natural history, the compound mineral glebe, territory of Otranto, situated thirty miles north-west of the city of Otranto.

ORIFICE, the mouth or aperture of a tube, pipe, or other cavity.

ORGAL, among dyers, denotes the lees of wine dried.

ORGAN, in general, is an instrument or machine designed for the production of some certain action or operation; in which one or more of the mechanic powers, machines, and engines are used to perform the work desired. St. Jerome mentions one with twelve pair of bellows, which might be heard a thousand paces, or a mile; and another at Jerusalem, which might be heard at the mountain of Olives.

There is one in the cathedral church of Ulm, in Germany, that is sixty-three feet high, and twenty-eight feet broad; the biggest pipe is thirteen inches in diameter; and it has sixteen pair of bellows.

The modern organ is a buffet, containing several rows of pipes. The size of the organ is generally expressed by the length of its biggest pipe; thus we say an organ of thirty-two feet, of sixteen, of eight, and of two feet.

Hydraulic Organ, denotes a musical machine that plays by means of water instead of wind. Of these there are several in Italy in the grottoes of vineyards. Ctesebeus of Alexandria, who lived in the time of Ptolemy Euergetes, is said to have first invented organs that played by compressing the air with water, as is still practiced. Archimedes and Vitruvius have left us descriptions of the hydraulic organ.

ORGASM, an ecstacy, or impetuous desire of coition, occasioned by a turgescency of the seminal vesicles.

ORGLA, in antiquity, feasts and sacrifices performed in honour of Bacchus, instituted by Orpheus; and chiefly celebrated on the mountains by wild drugged women, called Bacchinae. See Bacchanalia, and Dionysia.

ORGIVA, a town of Spain, in the province of Granada, twenty-five miles south of Granada.

ORGUES is also used for a machine, composed of several harquebuffs or musquet-barrels bound together, by means whereof several explosions are made at the same time, used to defend breaches and other places attacked.

ORION, in astronomy. See Astronomy, p. 487.

ORLEA, or Orlo, in architecture, a fillet under the ovolo or quarter round of a capital. When it is at the top or bottom of the shaft, it is called cincture.

ORLON, in fortification, is a small rounding of earth faced with a wall; raised on the shoulder of those bastions that have camedes, to cover the cannon in the retired flank, and prevent their being dismounted by the enemy. See Fortification.

ORIOLUS, in ornithology, a genus belonging to the order of picce. The bill is conical, convex, very sharp, and fhrapt, the superior mandible being much longer than the under one; and the tongue is forked and sharp. There are 20 species, principally distinguished by their colour.

ORKNEY ISLANDS, certain islands on the north of Scotland, from which they are separated by a frith twenty miles in length, and ten in breadth. These islands are forty in number, and together with the island of Zetland send one member to parliament, and another for the burghs of Kirkwall, &c.
Orle, in heraldry, an ordinary, in form of a fillet, drawn round the shield, near the edge or extremity thereof, leaving the field vacant in the middle. Its breadth is but half that of the trefoir or bordure, which contains a sixth part of the shield; and the orle, only a twelfth, besides that the orle is its own breadth distant from the edge of the shield, whereas the bordure comes to the edge itself. The form of the orle is the same with that of the shield, whence it resembles an escutcheon. See Plate CXXXIV. fig. 6, which represents an orle argent in a field gules.

Orleans, a province or government of France, bounded by Normandy and the Isle of France, on the north; by Champaign and Burgundy, on the east; by Lyonois and Guienne, on the south; and by Brittany and the bay of Biscay, on the west.

Orleans, a city of France, capital of Orleans, situated on the river Loire, in E. long. 2°, N. lat. 47° 55'.

Orleans is also the name of an island and town on the river of St. Laurence, in Canada: W. long. 73°, N. lat. 47°.

Orlope, in the sea-language, the uppermost space or deck in a great ship, reaching from the main-mast to the mizen. In three-deck ships, the second and lowest decks are sometimes called orlopes.

Ormond, the north division of the county of Tipperary in Ireland.

Ormus, an island at the entrance of the gulf of Persia, situated opposite to Gombron on the continent, in E. long. 56°, N. lat. 29° 30'. This island is thirty miles in circumference.

Ornithogalum, in botany, a genus of the hexandria monogynia class. The corolla consists of six erect petals; and the filaments are alternately wider at the base. There are 11 species, three of them natives of Britain, viz. the luteum, or yellow star of Bethlehem; the pyrenaicum, or spiked star of Bethlehem; and the umbrellatum, or common star of Bethlehem.

Ornithology, that branch of natural history which treats of birds. See Natural History.

Ornithomancy, a species of divination, performed by means of birds; being the same with augury. See Divination and Augury.

Ornithopus, in botany, a genus of the diadelphia decandria class. The pod is jointed, cylindrical, and arcuated. There are four species, only one of which, viz. the perpusillus, or birds-foot, is a native of Britain.

Orobanche, in botany, a genus of the didynamia angiospermia class. The calix is bifid, and the corolla is gent; the capsule has two valves, and contains many seeds. There are seven species, two of them natives of Britain, viz. the major, or broom-rape; and the ramosa, or branched broom-rape.

Orobus, in botany, a genus of the diadelphia decandria class. The stylus is linear; the calix is blunt at the base, the superior segments of it being shorter. There are nine species, two of them natives of Britain, viz. the tuberosus, or wood-pease; and the sylvaticus, or bitter vetch.

Oronoque, a river of South America, which falls into the Atlantic ocean in 8° N. lat. almost opposite to the island of Trinity.

Orontium, in botany, a genus of the hexandria monogynia class. The spadix is cylindrical, and covered with filacles; the corolla consists of six petals; it has no styles; and the capsule has three cells. There is but one species, a native of Virginia.

Orphan, a fatherless child, or minor; or one that is deprived both of father and mother.

Orphus, in ichthyology. See Sparus.

Orpiment, in natural history, a fossilizable substance usually found in copper-mines, composed of thin flakes, like the talc; which easily split, and are flexible, and not elastic, fusible in oil, fusible in a moderate fire, and yielding in burning an offensive smell like garlic.

Orsano, the uppermost space or deck in a great ship, reaching from the main-mast to the mizen. In three-deck ships, the second and lowest decks are sometimes called orlopes.

Orsolo, a vessel of war of the Turkish dominions, and in Germany. And, 3. Red-orpiment, which is of a fine bright red: this is a very beautiful substance of a fine bright red, very glozzy, and a little transparent, and is found in the Turkish dominions, in the islands of the Archipelago, and even in Cornwall, where it is known under the name of red mandric.

Geoffroy declares it a corrosive and poisonous mineral; on the other hand, Boerhaave declares orpiment an innocent and harmless medicine; and Hoffman, who has been at more pains than any body to examine into its nature, declares the same, and even gives instances of its being given to dogs without any harm.

It is an excellent depilatory, mixed with lime, and made into a pafte with water. The painters are fond of it as a golden colour; and a lixivium of it, with quick-lime, makes sympathetic ink.

Orpine, in botany. See Sedum.

Orrey, a curious machine, or movement, for representing the motions and appearances of the heavenly bodies. See Astronomy, p. 495.

Orrice. See Iris.

Ortegal castle and cape, the most northerly promontory of Spain, thirty miles north-east of Ferrol: W. long. 8° 22', N. lat. 44°.

Ortega, in botany, a genus of the triandria monogynia class. The calix consists of five leaves; the corolla is wanting; and the capsule has one cell, and many seeds. There is but one species, a native of Spain.

Orthodox, in church-history, an appellation given to those who are found in all the articles of the Christian faith.

Orthographic projection of the sphere, that where-in the eye is supposed at an infinite distance; so called, because the perpendiculars from any point of the sphere will all fall in the common intersection of the sphere, with the plane of the projection.

Ortho-
ORTHOGRAPHY, that part of grammar which teaches the nature and affections of letters, and the just method of spelling or writing words with all the proper and necessary letters, making one of the four greatest divisions or branches of grammar. See GRAMMAR.

ORTHOGRAPHY, in geometry, the art of drawing or delineating the fore-right plan of any object, and of expressing the heights or elevations of each part. It is called orthography, from its determining things by perpendicular lines falling on the geometrical plane.

ORTHOGRAPHY, in architecture, the elevation of a building.

ORTHOGRAPHY, in perspective, is the fore-right side of any plane, i.e., the side or plane that lies parallel to a straight line, that may be imagined to pass through the outward convex points of the eyes, continued to a convenient length.

ORTHOPNOEAE, in medicine, a species or degree of asthma, where there is such a difficulty of respiration, that the patient is obliged to sit or stand upright, to be able to breathe. See MEDICINE.

ORTON, a market town of Westmoreland, situated ten miles south-west of Appleby.

ORVALA, in botany, a genus of the didynamia gymnospermae class. The superior lip of the corolla is divided into three segments, each being toothed; and the inferior or lip is cordated and crenated. There is but one species, a native of Italy.

ORVIETTO, a city of Italy, in the pope's territories, capital of the province of Orvietto, situated at the confluence of the Tiber and the Chiane: E. long. 13°, N. lat. 43°.

ORWELL, a river of Suffolk, which, rising in the middle of that country, runs south-east by Ipswich, and falls into the German sea at Languard-fort.

ORYZA, RICE, in botany, a genus of the hexandria digynia class. The calyx is a double-valved glume, with one flower; and the corolla consists of two equal valves. There is but one species.

This plant is cultivated in vast abundance in the East, as also in Carolina, for food. It is said to be good in dymenteries, diarriheas, &c.

OSACA, a great city and port-town of Japan, situated on a bay of the sea, on the east side of the island: in E. long. 135°, N. lat. 35°.

OSBECKIA, in botany, a genus of the oenandra monogynia class. The calyx consists of four segments, and the corolla of four petals: and the capsule has four cells. There is but one species, a native of India.

OSCHEOCELE, in surgery, a hernia of the ferotum. See SURGERY.

OSCILLATION, in mechanics, the vibration, or reciprocal ascent and descent of a pendulum. See MECHANICS.

OSMUNDA, in botany, a genus of the cryptogamia filicium class. The spike is full of branches, and the fructification is round. There are 17 species, none of them natives of Britain.

OSNAPBURG, the capital of the bishopric of the same name, in the circle of Westphalia: E. long. 7° 40', N. lat. 52° 31'. The territories of this bishopric, which are forty miles long, and thirty broad, are subject to its bishop; and this bishopric is alternately held by a protestant and papist, the protestant being always a prince of the house of Brunswick.

OSORNO, a town of Chili in South America: W. long. 80°, S. lat. 41°.

OSPREY. See FALCO.

OSSEIFICATION, the formation of bones, but more particularly the conversion of parts naturally soft to the hardness and consistence of bones. See ANATOMY, p. 148.

OSSORY, the west division of Queen's county in Ireland.

OSSUNA, a town of Spain, in the province of Andalusia, forty miles east of Seville.

OSTAGIO, a town of Italy in the territory of Genoa, fifteen miles north-west of Genoa.

OSTEND, a city and port-town of the Austrian Netherlands, in the province of Flanders, situated twelve miles west of Bruges: E. long. 2° 45', N. lat. 51° 15'.

OSTEOSPERMUM, in botany, a genus of the syngenesia class. The receptacle is naked; it has no pappus; the calyx consists of many leaves; and the seeds and the number of spines near the tail.

OSTEOLOGY, that branch of anatomy which treats of the bones. See ANATOMY, Part I.

OSTEOSPERMUM, in botany, a genus of the syngenesia polygamia necessaria class. The receptacle is naked; it has no pappus; the calyx consists of many leaves; and the seeds are round and hard. There are five species, none of them natives of Britain.

OSTIA, a port-town of Italy, in the pope's territories, situated at the mouth of the Tiber: E. long. 13°, N. lat. 41° 30'.

OSTRACION, in zoology, a genus of the amphibia nantes class. It has ten long, cylindrical, obtuse teeth in each jaw; the aperture is linear; the body is covered with a bony substance; and it has no belly-fins. There are nine species, principally distinguished by the angles of their bodies and the number of spines near the tail.

OSTRACISM, in Grecian antiquity, denotes the banishment of such persons whose merit and influence gave umbrage to the people of Athens, lest they should attempt anything against the public liberty. It was so called, because the people...
OTLEY, a market-town, twenty-one miles west of York.

OSTRACITES, in natural history, the name by which authors call the soluble oyster-shell.

Ostracites has the same medicinal virtues with the belemnites, and lapis judaicus, only in a higher degree; being accounted by Dr. lifter one of the greatest known medicines in nephritic cases: the dose, in powder, is from half a dram to a dram; in white-wine; and to prevent a sickness at the stomach, that sometimes attends the taking it, one third part of the quantity of powdered chamomile-flowers may be mixed with it.

OSTREA, the oyster, in zoology, a genus belonging to the order of vermes testacea. The shell has two unequal valves; the cario has no teeth, but a small hollow pit, with transversal lateral breaks. There are 31 species, principally distinguished by peculiarities in their shells. The common oyster is used both raw, and variously prepared as food.

OSTRICH, in ornithology. See Struthio.

OSTROGANOFF, a town of the Russian empire, on the river Volga, between the Black Sea and the Caspian, thirty-three miles west of Kazan.

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OSTRICH, in ornithology. See Struthio.

OSTWEGO, a town of the Iroquois, in North America, three hundred miles west of Albany, in New-York.

OSTWERY, a market-town in Shropshire, fifteen miles north-west of Shrewsbury.

OTIS, in botany, a genus of the dicotyledonous class, the calix of both male and female consists of three segments; neither of them has any corolla; the female has no style, but a roundish stigma; and the drupa has but one cell. There is only one species, a native of Italy.

OTONNA, in botany, a genus of the commelinaceae class. The receptacle is naked; it has no pappus; and the calix is somewhat cylindrical, and consists of many leaves. There are two species, two of them natives of Britain, viz. the palustris, or marsh fleabane; and the integriolia, or mountain ragwort.

OTOQUE, an island situated in the bay of Panama, from whence the city is furnished with provisions: W. long. 83°, N. lat. 70°.

OTRANTO, a city and archbishop's see of the kingdom of Naples, situated at the entrance of the gulph of Venice: E. long. 19° 15', N. lat. 40° 12'.

OTTEN, in zoology. See Mustela.

OTTOMAN, or Ottoman, an appellation given to the Turkish empire, from Othomannus, or Olmahanus, the first emperor of the present family.

OTTONA, or Ostona, a city of the kingdom of Naples, situated on the gulph of Venice: in E. long. 15° 30', N. lat. 42° 22'.

OVAL, an oblong curvilinear figure, otherwise called eclipis. See Conic Sections.

OVARIES, in anatomy. See Anatomy, p. 275.

OVATION, in the Roman antiquity, a lesser triumph, allowed to commanders for victories won without the effusion of much blood; or for defeating a mean and insignificant enemy. The show generally began at the Albanian mountain, whence the general with his retinue made his entry into the city on foot, with many flutes or pipes sounding in concert as he passed along, and wearing a garland of myrtle as a token of peace. The term ovation, according to Servius, is derived from ovis, sheep, because on this occasion the conqueror sacrificed a sheep, as in triumph he sacrificed a bull.

OVEDENARDE, a town of the Austrian Netherlands, in the province of Flanders, situated on the river Scheld, thirteen miles south of Ghent.

OUDENBURG, a town of the Austrian Netherlands, in the province of Flanders, five miles south-east of Odend.

OVERHALE, in the Fea-language. A rope is laid to be overhaled wben drawn too tight, or haled the contrary way.

OVER-RAKE, among seamen: When a ship, riding at anchor, so overrakes herself into an high sea, that she is washed by the waves breaking in upon her, they say the waves over-rake her.

OVERMAN, in Scots law; a person named by arbiters, or by the parties submitters, to determine the matter submitted, in case the parties disagree in their opinion.

OVERT, the same with open: thus an overt act signifies an act which, in law, must be clearly proved; and such is to be alleged in every indictment for high treason.

OVER-TURE, or Overture, opening or preluding; a term used for the solemnities at the beginning of a public act or ceremony; an opera, tragedy, concert of music, &c.

The overture of the theatre, or scene, is a piece of music usually ending with a fugue: the overture of a juvenile is a general prelucion, &c.

OVERYSCHE, a town of the Austrian Netherlands, in the province of Brabant, situated on the river Ysche, nine miles north-east of Brussel.

OVERYSEL, one of the united provinces, bounded by Groningen on the north, by Westphalia on the east, by Zutphen on the south, and by Gelderland, the Zuyder-see, and Friesland, on the west.

OVIEIDA, in botany, a genus of the didynamia angiospermia class. The calix consists of five segments; the corolla is a long cylindrical tube; and the berry is round, containing two seeds. There are two species, none of them natives of Britain.

OVIEDO, a city of Spain, capital of the province of Asturias; situated on the river Afia, fifty miles north of Leon, in W. long. 6° 40', N. lat. 43° 30'.

OVIAN, or Septa, in ancient Rome, a place the vilia was not by stairs, but by pontes, or narrow boards, laid there for the occasion; on which account de ponte desjicivis to be denied the privilege of voting; and persons thus dealt with, were called deponenti.

Oviparous, a term applied to such animals as bring forth their young from eggs; as birds, insects, &c.

OVIS, in zoology, a genus of the mammalia class, and of the order of pecora; the characters of which are these: The horns are concave, turned backwards, twisted, and full of wrinkles; there are eight teeth, first and second incisors, and eight others.

OVIPAROUS, a term applied to such animals as bring forth their young from eggs; as birds, insects, &c.
OVID

Aries, or ram and sheep, the horns of which are shaped like a half moon, and compressed. This animal is perhaps the most gentle and inoffensive, and at the same time the most timid and stupid, of all quadrupeds. In a flock of sheep, there is always a leader, whose feet the rest implicitly and blindly follow. If he runs over a precipice, the whole flock follow his example, and cannot be restrained though evident destruction be the consequence. The smallest noise, if uncommon, makes them run precipitately, against each other, without knowing the cause of their danger, or being able to extricate themselves. In snow, they remain fixed in the same spot; and continue obstinately in that situation, unless they are forced to move by the shepherd or his dog. But though daftardly in itself, though almost devoid of sentiment and mental qualities, this animal is of the most extensive utility to man. It affords us both food and clothing, besides the advantages we derive from its milk, its skin, and its tallow.

Love, the liveliest sentiment in all animals, is the only passion which inspires the ram with any degree of vivacity; when under the influence of this passion, he becomes petulant, runs against his neighbours, and sometimes even attacks the shepherd himself. But the ewe, or female, though in the same situation, does not appear to be in the least affected; the seems to have no other instinct than that of simply admitting the embraces of the ram, eating her food, and recognizing her offspring; the lamb, on the other hand, is endowed with the same instinct of distinguishing its mother from the rest of the flock.

This animal, so soft and so simple in its nature and disposition, is likewise extremely weak and feeble in its constitution: They can endure but little fatigue; whenever they run, their hearts palpitate, and their wind fails them; they are equally incapable of bearing heat or cold, snow or rain: They are subject to many diseases, most of which are contagious: They bring forth their young with pain and difficulty, and require more care and attention than any other domestic animal.

The ram is capable of generation at the age of 18 months; and the ewe can be impregnated when a year old. One ram is sufficient for 30 or 40 ewes. He ought to be strong, well proportioned; his head should be thick and strong, his front large, his eyes black, his nose flat, his neck thick, his body long and tall, his testicles firm, and his tail long. White is the best colour for a ram. The horns of which are shaped like a half moon, and compressed. The ram, ewe, and weather, when one year old, lose the two foreteeth of the under jaw; six months afterwards, they lose the two foreteeth next to these; and at the age of three years, the teeth are all replaced. The age of a ram may likewise be discovered by their horns, which always appear the first year, and frequently as soon as they are brought forth. These horns uniformly acquire an additional ring every year as long as the creature lives. The ewes commonly have no horns, but a kind of long protuberances in place of them; however, some of them have two, and some four horns.

In Spain, and the southern parts of Europe, the flocks are kept in shades or stables during the night: but in Britain, where there is now no danger from wolves, they are allowed to remain without, both night and day; which makes the animals more healthy, and their flesh a more wholesome food. Dry and mountainous grounds, where thyme and sheep's fefca graze abound, are the best for the pasturing sheep.

The Guineenfis, or Guinea sheep, has pendulous ears, lax hairy dew laps, and a prominence on the hind part of the head. The wool is short, like that of a goat. It is a native of Mount Iola.

OULNEY, a market-town of Buckinghamshire, situated nine miles south-east of Northampton.

OULZ, a town of Italy, in the province of Piedmont, situated in E long. 6° 30', N. lat. 45'.

OUNCE, a little weight, the sixteenth part of a pound avoirdupois, and the twelfth part of a pound troy.

OUCHE, in zoology. See Loxo.

OUNDLE, a market-town of Northamptonshire, situated on the river Nen, twenty-two miles north-east of Northampton.

OVOLO, or Ovum, in architecture, a round moulding, whose profile, or sweep, in the Ionic and Corinthian capitals, is usually a quadrant of a circle; whence it is also commonly called the quarter-round. It is usually cut with the representation of eggs and anchors or arrows heads placed alternately.

OUSE, a river, which, rising in the north of Yorkshire, runs south-east by York; and, continuing that course, falls into the Trent.

OUSTIACH, or OUSTIACH Country, is a part of Asiatic Russia, extending along the river I trauma to its confluence with the river Obi; and from thence north-west along the banks of the Oby and Jenifa, into the gulf of the Mandrake, or the frozen ocean; and extending also along the

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OXUS, a river which rises in the mountains on the north of India; and running north-west, through Ufbc Tartary, afterwards separates from Ufbc Tartary, and falls into the Caspian sea, in 45° N. lat.

OXUS, in botany. See Vaccinium.

OXUS, in zoology. See Mus.

OXYCROCEUM, in pharmacy, &c. A preparation much used in plasters for fractures, &c. made as follows: Take yellow wax, one pound; pitch and galbanum, each half a pound; melt them over a gentle fire; and then add of Venice-turpentine, myrrh, and olibanum, each three ounces; saffron, two ounces; make them into a plaster.

OXYGLYCU, a species of drink prepared of the sweetest honey combs, macerated and boiled. The combs from which all the honey has been expressed, are put into a pot with pure water, and boiled till they seem to have deposited all their contained honey in the water. This liquor is to be kept, and, when diluted with cold water, is to be drank in the summer-time, in order to remove thirst.

OXYMELO, in pharmacy, a composition of vinegar and honey.

There are several sorts of oxymel, whereof the simplest kind is made by boiling, in a glazed earthen vessel, and with a gentle fire, two pounds of clarified honey, in a pint of vinegar, to the confidence of a syrup.

OYER, in law-books, seems to have been anciently used for what is now called assizes.

OYER AND TERMINER, a commission directed to the judge of assize, and other gentlemen, empowering them to hear and determine all criminal causes, and to try all offenders, whether for treason, felony, or trespass.

OYES, or OYER, signifies Hear ye; and is frequently used by the clerks in our courts, on making proclamations, or to enjoin silence.

OYSTER, in zoology. See Ostrea.

OZAI, a foul and malignant ulcer of the nose, distin-

guished by its fetor, and often accompanied with a caries of the bones of the nose.

PABULUM. See Fuel and Fire.

PACA, in zoology. See Mus.

PACE, a measure taken from the space between the two feet of a man, in walking; usually reckoned two feet and a half, and in some men a yard or three feet.

The geometrical pace is five feet; and 60000 such paces make one degree of the equator.

PACE, in the manege, is of three kinds, viz. walk, trot, and gallop; to which may be added an amble, because some horses have it naturally.

PACIFIC
PACIFIC OCEAN, that vast ocean which separates Asia from America: it is called Pacific, from the moderate weather the first mariners who failed in it met with between the tropics; and it was called fourth-sea, because the Spaniards crossed the illusium of Darien from north to south, when they first discovered it; though it is properly the Western ocean, with regard to America.

PACK, in commerce, denotes a quantity of goods, made up in loads, or bales, for carriage.

A pack of wool is seventeen stone and two pounds, or a horse’s load.

PACKAGE, is a small duty of one penny in the pound, paid for all goods not particularly rated.

PACOS, in zoology. See Camelus.

PACTOLUS, a river of Lydia in the lesser Asia, celebrated by the ancient poets for its golden sands.

PADDOC, or Paddock-course, a piece of ground encompassed with pales or a wall, and taken out of a park for exhibiting races with grey-hounds, for plates, wagers, or the like.

PADDERBORNE, the capital of the bishopric of the same name in Westphalia: E. long. 8° 25’, N. lat. 51° 45’.

PADSTOW, a market town of Cornwall, thirty miles west of Launceston.

PADUA, the capital of the Paduan, in Italy, a city of a circular form, situated twenty-two miles west of Venice: E. long. 12° 15’, N. lat. 45° 30’.

PADUAN, a province of Italy, in the territories of Venice, thirty-five miles long, and almost as much in breadth; bounded by the Trevifane on the north, by the duchy of Venice on the east, by the Polesin de Rovigo on the south, and by the Vicentin on the west.

PADUAN, among the medals, a modern medal struck in imitation of the antique; or a new medal struck with all the marks and characters of antiquity.

PADUS, in botany. See Prunus.

PAEAN, among the ancient pagans, was a song of rejoicing sung in honour of Apollo, chiefly used on occasions of victory and triumph.

PAEAN, in the ancient poetry, a foot consisting of four syllables; of which there are four kinds, the pean primus, secundus, &c.

The pean primus consists of one long syllable and three short ones, or a trochus and pyrrhichius, as temporibus; the pean secundus consists of a short syllable, a long, and two short, or an iambus and a pyrrhichius, as potentia; the pean tertius consists of two short syllables, a long and a short one, or a pyrrhichius and a trochus, as animatus; the pean quartus consists of three short syllables and a long one, or a pyrrhichius and iambus, as cellatar.

PAEDEROTA, in botany, a genus of the diandria monogynia class, of which there are two species, none of them natives of Britain.

PAEDO-BAPTISM, infant-baptism, or that conferred on children.

PAEONIA, in botany, a genus of the polyandria digynia class. The calix consists of five leaves, and the corolla of five petals; the stylus is wanting; and the capsule contains many seeds. There are two species, none of them natives of Britain.

The root of this plant is a very celebrated medicine in nervous cases.
Oil to the eye, as a good piece of musick to the ear. By this means the picture is not only more delightful, but better seen and comprehended. 4. The drawing must be firm; nothing must be flat, lame, or ill proportioned; and these proportions should vary according to the characters of the persons drawn. 5. The colouring, whether gay or fold, must be natural, beautiful, and clean, and what the eye is delighted with, in shadows, as well as lights and middle tints; and whether the colours are laid on thick, or finely wrought, they must appear to be done by a light and accurate hand. Lastly, Nature must be the foundation that must be seen at the bottom; but nature must be raised and improved, not only from what is commonly seen, to what is but rarely met with, but even yet higher, from a judicious and beautiful idea in the painter’s mind, so that grace and greatness may shine throughout: more or less according to the subject.

Painting is of various kinds, according to the materials used, the matter upon which they are applied, and the manner of applying them; as painting in oil, in water-colours, fresco, &c.

Painting in oil. The whole secret of painting in oil consists in grinding the colours with nut oil, or linseed-oil, but the manner of working is very different from that in fresco, or in water, by reason the oil does not dry near so fast, which gives the painter an opportunity of touching and re-touching all the parts of his figures as often as he pleases; which in the other methods of painting is a thing impracticable. The figures done in oil are also capable of more force and boldness; inasmuch that the black becomes blacker, when ground with oil, than with water; besides, all the colours mixing better together, makes the colouring the swifter, more delicate and agreeable, and gives an union and tenderness to the whole, invincible in any of the other manners.

Painting in oil is performed on canvas, on walls, wood, stone, and all sorts of metals. 1. Painting on cloth or canvas is done as follows: The canvas being stretched on a frame, give it a layer of size, or paste-water, and then go over it with a mince or flone to smooth off the knots. By means of the size, the little threads and hairs are all laid close on the cloth, and the little holes filled up, so that no colour can pass through. When the cloth is dry, lay on oker in oil, which may be mixed with white-lead to make it dry the sooner. When dry, go over it again with the pumice-stone, to make it smooth. After this a second couch is sometimes applied, composed of white-lead and a little charcoal-black, to render the ground of an ash colour. Others prime the canvas in the following manner: They first smooth the canvas with a pumice- or flone, fix it over with a good size and a little honey, and let it stand to dry, after which they lay it over with whitening and size, mixed with a little honey: the use of the honey is to prevent it from cracking, peeling, and breaking out; on this they first draw the picture with a coal, and then lay on the colours. 2. Painting on walls: When the wall is dry, they give it two or three washes with boiling oil; till the plaster remains quite greasy, and will imbibe no more; upon this they lay drying colours, such as white-charcoal, red-oker, or other chalks beaten pretty stiff. When this couch or layer is well dried, the subject or design is sketched out, and afterwards painted over, mixing a little varnish with their colours, to save the varnishing afterwards. In order the better to fortify the wall against moisture, some cover it with a plaster of lime, marble-dust, or a cement made of burnt tiles mixed in linseed-oil; and at last prepare a composition of green-pitch, mastic, and thick varnish boiled together, which they apply hot over the former plaster; and when dry, lay on the colours as before. Others, in fine, make their plaster with lime-mortar, tile-cement, and sand; and this being dry, they apply another of lime, cement, and iron scorze, which being well beaten, and incorporated with linseed-oil and whites of eggs, makes an excellent plaster. When this is dry, the colours are laid on as before. 3. In painting on wood, they usually give their ground a couch or layer of white tempered with size, and then proceed as in painting on walls. 4. In painting on stone or metals, it is not necessary to lay them over with size, but only to add a light couch of colours before the design is drawn on it; nor even is this done on stones, where you would have the ground appear, as in certain marbles and agates of extraordinary colours.

All the colours used in fresco are good in oil, except white of lime and marble dust. Thosse chiefly used are white-lead, or cerufa, yellow and white mastic, orniment, vermilion, lacca, blue and green athes, verdigris, indigo, fmal, black-lead, ivory-black, lamp-black, &c. As to oils, the best are those of linseed, walnuts, spike, and turpentine. The drying oils are nut-oil, boiled with thyme and sandarach, and otherwise with spirit of wine, mastic, and gum-lacca.

In the preparation of oil-colours, care must be taken that they be ground fine; that in putting them on a pallet, those which will not dry of themselves may be mixed with drying oil, or other ingredients of a dying quality, and that the tinged colours be mixed in as small quantities as possible. As to the situation of the colours, the purest and strongest must be placed in the front of the piece, and the colouring varied according to the subject, time, and place. If the subject be grave, melancholy, or terrible, the general tint of the colouring must incline to brown and black, or red and gloomy; but it must be gay and pleasant in subjects of joy and triumph.

PALÆSTRA, in Grecian antiquity, a public building, where the youth exercised themselves in wrestling, running, playing at quoits, &c.

PALÆSTROPHYLAX, was the director of the palaistra and the exercises performed there.

PALS, a town of France, in the province of Gascony, capital of the lower Navarre, situated in W. long. 1° 8', N. lat. 43° 23'.

PALAMBOANG, or Palambang, the capital of a kingdom at the east end of the island of Jave, in the East Indies, situated on the straits of Bally, in E. long. 114°, S. lat. 7° 30', and separated from the island of Bally by a narrow strait.

PALAMEDIA, in ornithology, a genus belonging to the order of grallie. The bill is conical, the superior mandible being crooked; and the feet have three divided toes. There are two species, both natives of Brazil.

PALARIA, among the Romans, a kind of exercize, performed at a stake by the soldiers. The stake being fixed in the ground, and six feet high above it, the young undisciplined soldiers advanced against it, armed with a hurdle and cudgel, instead of a shield and sword, and went through all the rules of attack and defence, as if actually engaged.
engaged with an adversary. Sometimes they flood at a distance, and attacked with misive weapons, at the same time using all the requisite motions for defending themselves, and warding off what might be thrown against them.

PALATE, in anatomy. See Anatomy, p. 162, 303.

PALATINATE, a province, or signiory, possessed by a palatine.

PALATINE, or Count Palatine, a title anciently given to all persons who had any office or employment in the prince's palace; but afterwards conferred on those delegated by princes to hold courts of justice in the provinces; and on such among the lords as had a palace, that is, a court of justice, in their own houses.

At present the word palatine is restricted to a prince of Germany, or a lord of Poland, possessed of a palace.

PALATO-salpingæus. See Anatomy, p. 303.

PALATO-staphylinus, in anatomy. See Anatomy, p. 303.

PALE, a little pointed flake or piece of wood, used in making inclosures, separations, &c. The pale was an instrument of punishment and execution among the ancient Romans, and still continues so among the Turks. Hence impaling, the passing a sharp pale up the fundament through the body.

PALE, in heraldry, one of the honourable ordinaries of an escutcheon; being the representation of a pale or flake placed upright, and comprehending the whole height of the coat from the top of the chief to the point. When the pale is single, it is to contain one third of the breadth of the shield. See Plate CXXXIV. fig. 7.

Palermo, the capital of the island of Sicily, situated on the north coast of that island, on a bay of the Mediterranean sea: in E. long. 13°, S. lat. 38° 30'.

Palestine, a part of Asiatic Turkey, situated between thirty-six and thirty-eight degrees of east longitude, and between thirty-one and thirty-four degrees of north latitude; it is bounded by Mount Libanus, which divides it from Syria, on the north; by Mount Hermon, which separates it from Arabia Deserta, on the east; by the mountains of Seir and the Deserts of Arabia Petraæa, on the south; and by the Mediterranean sea, on the west.

It was called Palestine, from the Philistines who inhabited the sea-coasts. It was also called Judaæa, from Judah; and the Holy Land, from our Saviour's residence and sufferings in it; and it is called Canaan, and the Promised Land, in the scriptures.

It is 150 miles in length, and 80 in breadth; and in the time of Solomon it seems to have extended from the Mediterranean sea to the river Euphrates.

Palestrina, a city of Italy, in the pope's territory and Campania of Rome, situated thirty miles east of Rome.

Palimbam, a town on the island of Sumatra, in the East-Indies, situated in E. long. 103°, S. lat. 3°.

Palindromus, a verse or sentence which runs the same when read either backwards or forwards; such is the verse,

Roma bibi stabit mutatis ibit amor.

Palining, a sort of fencing for fruit-trees planted in fields, wherein three small posts are erected at a foot and a half distance one from another, and near the top nailed to each other with crofs-bars.

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PALINGENESIA, among divines, signifies the same with regeneration.

Among chemists, it denotes the producing a body from its principles.

PALINODY, a discourse contrary to a preceding one; hence the phrase palinodiam canere was taken for a recantation.

Palisade, in fortification, an inclosure of stakes or piles driven into the ground, each six or seven inches square, and eight feet long, three whereof are hid under ground.

Palisse, in heraldry, a bearing like a range of palisades before a fortification, represented on a feffe, rising up a considerable height, and pointed a-top, with the field appearing between them. See Plate CXXXIV. fig. 8.

Paliurus, in botany. See Rhamnus.

Pall, in heraldry, denotes a kind of cross representing the pallium, or archiepiscopal ornamental fent from Rome to the Metropolitans. See Plate CXXXIV. fig. 9.

Palla, in Roman antiquity, a mantle which women wore over the gown called stola. It was borne on the left shoulder; whence palling to the other side, under the right arm, the two ends were bound under the left arm, leaving the breast and arm quite bare.

Palladium, in antiquity, a statute of the goddes Pal. las, supposed to have dropped down from heaven; preferred in Troy, whereon the fate of that city is said to have depended.

Pallet, among painters, a little oval table, or piece of wood, or ivory, very thin and smooth; on and round which the painters place the several colours they have occasion for, to be ready for the pencil. The middle serves to mix the colours on, and to make the tints required in the work. It has no handle, but instead thereof, a hole at one end to put the thumb through to hold it.

Pallet, in heraldry, is nothing but a small pale, consisting of one half of it in breadth, and therefore there are sometimes several of them upon one shield.

Pallet, in ship-building, is a room within the hold, close parted from it, in which by laying some pigs of lead, &c. a ship may be sufficiently balasted, without losing room in the hold; which, therefore, will serve for the flowing the more goods.

Palliation, or a palliative cure, in medicine, is when, in desperate and incurable diseases, after predicting the fatal event, the physician prescribes some remedies for mitigating the pain or some other urgent symptoms, as in ulcerated cancers, or cancerous fistulas, and the like.

Pallium, or Pall, an archiepiscopal vestment, of white woollen cloth, about the breadth of a border, made round, and thrown over the shoulders.

Palm-sunday, in the Christian church, the Sunday next before Easter; being so called in memory of our Saviour's triumphal entry into Jerusalem when the multitude that attended him fireweld palm-branches in his way.

Palm-tree, in botany. See Phoenix.

Palm isle, one of the Canary-islands, sixty miles north-west of Teneriff.

Palmaris, in anatomy. See Anatomy, p. 159.

Palimated, something resembling the shape of the hand: thus we say palmated leaves, roots, stiles, &c.

Palmipeedes, among ornithologists, the same with web-footed birds.
PALMISTRY, a kind of divination, or rather a deceitful art practised by gypsies, who pretend to forestall events by looking upon the lines and marks of the hand.

PALMYRA, the ruins of a magnificent city, in the province of Syria, two hundred miles south-east of Aleppo.

PALOS, a port-town of Spain, situated on the bay of Cadiz: W. long. 7° 15', N. lat. 37°.

PALPABLE, something perceivable by the senses, particularly that of feeling.

PALPITATION, a spastic contraction of the heart, when it leaps and beats violently.

PALS, in medicine. See Medicine, p. 97.

PALUDAMENTUM, in Roman antiquity, a habit that differed in little from the chlamys, except that this last belonged chiefly to the lower classes of people. See Chlamys.

PALUMBUS. See COLUMBIA.

PALLY, or PALL, in heraldry, is when the shield is divided into four or more equal parts, by perpendicular lines falling from the top to the bottom. See Plate CXXXIV. fig. 1c.

Pally bendy is when the escutcheon is divided by perpendicular lines, which is pally; and also by diagonals, which is called bendy. See the article Bendy.

PAMPULUNA, the capital of Spanish Navarre, is the seat of a bishop, and an university: W. long. 1° 30', N. lat. 43° 15'.

PANACEA, among physicians, denotes a universal medicine, or a remedy for all diseases; a thing impossible to be obtained.

PANADA, a diet consisting of bread boiled in water to the taste of a bishop, and an university: W. long. 1° 30', N. lat. 43° 15'.

PANACEA, among physicians, denotes an universal medicine, or a remedy for all diseases; a thing impossible to be obtained.

PANAMA, the capital city of the province of Darien, in South America, where the treasures of gold and silver, and the other rich merchandise of Peru, are lodged in magazines till they are sent to Europe: W. long. 82°, N. lat. 43° 15'.

PANARO, a river of Italy, which rising in the Appenine mountains, on the confines of Tuscany, divides Modena into the Gulph of Venice.

PANTHERA, the Scorpion-fly, in zoology, a genus of the hexandria monoelemma order. There are four species, distinguished by the colour of their wings.

PANCRATIUM, among the ancients, a kind of exercise, which consisted of wrestling and boxing. In these contests it was customary for the weaker party, when he found himself pressed by his adversary, to fall down, and fight rolling on the ground.

PANCREAS, in anatomy. See Anatomy, p. 263.

PANDESCTS, in the civil law, collections made by Justinian's order, of five hundred and thirty-four decisions of the ancient lawyers, on so many questions occurring in the civil law: to which that emperor gave the force and authority of law, by an epistle prefixed to them. The pandects consist of fifty books, and make the first part of the body of the civil law.

PANDICULATION, a stretching, or that violent and tense motion of the solids, which usually accompanies the act of yawning.

PANEYRIC, an oration in praise of some extraordinary thing, person, or virtue.

PANEYRICUM, in church-history, an ecclesiastical book, used by the Greek church, containing the panegyrical orations of various authors on the folemnities of Jesus Christ and the saints.

PANGONIA, in natural history, the name of a genus of crystal, consisting of such as are composed of many angles.

PANIC, denotes an ill-grounded terror or fright.

PANICLE, in botany, denotes a sheaf woolly beard, on which the seeds of some plants, as millet, reeds, etc., hang.

PANICUM, in botany, a genus of the triandria digynia clafs. The calix consists of three valves, the inmost of which is leafy. There are 28 species, four of which are natives of Britain, viz. the viride, or green panic-grass; the crusgalli, or loose panic-grass; the fangiuinale, or cock's-foot panic-grass; and the dactylon, or creeping panic-grass.

PANNEL, in law, signifies the prisoner at the bar, or person who takes his trial before the court of judiciairy, for some crime. See Law, Tit. xxxiii. 47.

PANNELS of a saddle, are two cushions or bolsters, filled with cow's, deer's, or horse-hair, and placed under the saddle, on each side, to prevent the bows and bands from galling the horse.

PANNICULUS CARNOSUS, in comparative anatomy, a robust fleshy tunic, situated in beasts, between the tunic and the fat; by means of which they can move their skin in whole or part: it is altogether wanting in mankind.

PANOPTRA, the Scorpion-fly, in zoology, a genus of insects belonging to the order of neuroptera. The rostrum is horned and cylindrical; there are two pappi, and three flomenta; the feelers are longer than the thorax; and the tail of the male is furnished with a forceps. There are four species, distinguished by the colour and shape of their wings.

PANTALOON,
PANTALOON, a sort of garment, consisting of breeches and stockings all of one piece; said to have been first introduced by the Venetians.

PANTHEON, in Roman antiquity, a temple of a circular form, dedicated to all the gods: It was built by Agrippa, son-in-law to Augustus; but is now converted into a church, and dedicated to the Virgin and all the martyrs.

PANTHÉON, in zoology. See Leo.

PANTOMIME, a person who imitates all sorts of actions and characters, by mere gestures, without speaking a word.

PANTOMIMA, a peperian who imitates all sorts of actions and characters, by mere gestures, without speaking a word.

PANTHER, in zoology. See Leo.

PANTHEON, in Roman antiquity, a temple of a circular form, dedicated to all the gods: It was built by Agrippa, son-in-law to Augustus; but is now converted into a church, and dedicated to the Virgin and all the martyrs.

PAP (453)

PAP, sheets of a thin matter, made of the same vegetable substance, as the range, or the reed kind. The second skin of the bark, which is soft and white, is ordinarily made use of for paper; this is beat in fair water to a pulp, which they take up in large moulds, so that some sheets are above twelve feet in length; they are completed, by dipping them sheet by sheet, in alum-water, which serves instead of the size among us, and not only hinder the paper from imbibing the ink, but makes it look as if varnished over. This paper is white, soft, and clothe, without the leaf roughness; though it cracks more easily than European paper, is very subject to be eaten by the worms, and its thinness makes it liable to be soon worn out.

Cotton-paper is a sort of paper which has been in use upwards of six hundred years. In the French king's library are manuscriptos on this paper, which appear to be of the Xth century; and from the XIth century, cotton manuscripts are more frequent than parchment ones. Cotton paper is still made in the East Indies, by beating cotton rags to a pulp.

Linen or European paper appears to have been first introduced among us towards the beginning of the XIVth century; but by whom this valuable commodity was invented, is not known. The method of making paper of linen or hempen rags, is as follows. The linen rags being carried to the mill, are first sorted, then washed very clean in wash-boards, whose sides are grated with strong wires, and the bottoms bored full of holes. After this they are fermented, by laying them in heaps clothe covered with flocking, till they sweat and rot, which is commonly done in four or five days. When duly fermented, they are twisted into handfuls, cut small, and thrown into oval mortars, made of well-seasoned oak, about half a yard deep, with an iron-plate at bottom, an inch thick, eight inches broad, and thirty long; in the middle is a washing-block, grooved, with five holes in it, and a piece of hair left on the inside; this keeps the hammers from touching it, and prevents anything going out except the foul water. These mortars are continually supplied with water, by little troughs from a cistern, fed by buckets fixed to the several floats of a great wheel, which raises the wooden hammers for pounding the rags in the mortars. When the rags are beaten to a certain degree, called the first fluff, the pulp is removed into boxes, made like corn-channers bins, with the bottom board affixed, and a little separation on the front for the water to drain away. The pulp of the rags being in; they take away as many of the front boards, as are needful, and piles the masts hard down with their hands; the next day they put on another board, and add more pulp, till the box is full; and here it remains mellowing a week, more or less, according to the weather. After this, the fluff is again put into clean mortars, and is beaten afresh, and removed into boxes, as before, in which flate it is called the second fluff. The masts is beat a third time, till some of it being mixed with fair water, and brewed to and fro, appears...
appears like flour and water, without any lumps in it: it is then fit for the pit-mortar, where it is perfectly dissolved, and is then carried to the vat, to be formed into sheets of paper. But lately, instead of pounding the rags to a pulp with large hammers, as above, they make use of an engine, which performs the work in much less time. This engine consists of a round solid piece of wood, into which are fastened several long pieces of steel, ground very sharp. This is placed in a large trough with the rags, and a sufficient quantity of water. At the bottom of the trough is a plate with steel bars, ground sharp like the former; and the engine being carried round with prodigious velocity, reduces the rags to a pulp in a very short time. It must be observed, that the motion of the engine causes the water in the trough to circulate, and by that means constantly returns the fluff to the engine. The trough is constantly fed with clean water at one end, while the dirty water from the rags is carried off at the other, through a hole, defended with wire gratings, in order to hinder the pulp from going out with the dirty water.

When the fluff is sufficiently prepared as above, it is carried to the vat, and mixed with a proper quantity of water, which they call priming the vat. The vat is rightly primed, when the liquor has such a proportion of the pulp, as that the mould, on being dipped into it, will just take up enough to make a sheet of paper of the thickness required. The mould is a kind of sieve exactly of the size of the paper to be made, and about an inch deep, the bottom being formed of fine brass wire, guarded underneath with sticks, to prevent it bagging down, and to keep it horizontal; and further, to strengthen the bottom, there are large wires placed in parallel lines, at equal distances, which form those lines visible in all white paper when held up to the light: the mark of the paper is also made in this bottom, by interweaving a large wire in any particular form. This mould the maker dips into the liquor, and gives it a shake as he takes it out, to clear the water from the pulp. He then slides it along a groove to the coucher, who turns out the sheet upon a felt laid on a plank, and lays another felt on it; and returns the mould to the maker, who by this time has prepared a second sheet in another mould: and thus they proceed, laying alternately a sheet and a felt, till they have made six quires of paper, which is called a poll, and this they do, with such swiftness, that, in many forts of paper, two men make twenty polls or more in a day. A poll of paper being made, either the maker or coucher whistles; on which four or five men advance, one of whom draws it under the press, and the rest press it with great force, till all the water is squeezed from it; after which it is separated sheet by sheet from the felts, and laid regularly one sheet upon another; and having undergone a second pressing, it is hung up to dry. When sufficiently dried, it is taken off the lines, rubbed smooth with the hands, and laid by till sized, which is the next operation. For this they chose a fine temperate day; and having boiled a proper quantity of clean parchment, or vellum shavings, in water, till it comes to a size, they prepare a fine cloth, on which they flew a due proportion of white vitriol and roch-alum finely powdered, and strain the size through it into a large tub; in which they dip as much paper at once as they can conveniently hold, and with a quick motion give every sheet its share of the size, which must be as hot as the hand can well bear it. After this, the paper is pressed, hung up sheet by sheet to dry; and being taken down, is sorted, and what is only fit for outside-quires laid by themselves; it is then told into quires, which are folded and pressed. The broken sheets are commonly put together, and two of the worst quires are placed on the outside of every ream or bundle; and being tied up in wrappers, made of the settling of the vat, it is fit for sale.

Paper is of various kinds, and used for various purposes; with regard to colour, it is principally distinguished into white, blue, and brown; and with regard to its dimensions, into atlas, elephant, imperial, super-royal, royal, medium, demy, crown, foolscap, and pot-paper.

Paper-office, an office in the palace of Whitehall, in which all the public writings, matters of state and council, proclamations, letters, intelligences, negotiations abroad, and generally all dispatches that pass through the offices of the secretaries of state, are lodged, by way of library.

Paphlagonia, an ancient province of the Jiffer Asia, situated on the Euxine-sea, now part of the province of Amasia in Turkey.

Paphos, once an elegant city at the west end of the island of Cyprus; but the little town of Baffo is now all that remains of it.

Papilio, the butterfly, in zoology, a genus of insects belonging to the order of lepidoptera. It has four wings, imbricated with a kind of downy scales; the tongue is convoluted in a spiral form; and the body is hairy. There are 273 species, principally distinguished by the colour of their wings.

Papilionaceous, among botanists, an appellation given to the flowers of plants belonging principally to the diadelpia clafs; from their resembling the figure of a butterfly.

Papous, or New Guinea, a large continent in the Pacific ocean, a little south of the equator; situated east of the Spence islands, in 130° east long. but how far it extends farther to the eastward or southward, is uncertain.

Pappus, in botany, a soft downy substance, that grows on the seeds of certain plants, as thistles, hawkweed, &c. serving to scatter and buoy them up in the air.

Par in commerce, signifies any two things equal in value. See Commerce.

Parable, a fable, or allegorical instruction, founded on something real or apparent in nature or history, from which a moral is drawn, by comparing it with something in which the people are more immediately concerned; such are the parables of Dives and Lazarus, of the Prodigal Son, of the Ten Virgins, &c.

Papoulce, made of paper, and called tapping. See Surgery.

Papula. See Conic Sections.

Paracentesis, an operation in surgery, commonly called tapping. See Surgery.

Paraclet, the Comforter, a name given to the Holy Ghost.

Paradisaea, in ornithology, a genus belonging to the order of pheas. The beak is covered with a belt or collar of downy feathers at the base; and the feathers on the sides are very long. There are three species, viz. 1. The spada, has the feathers on the sides longer than the body, and two long brilfully feathers in the tail. It is the greater bird of paradise, and feeds upon butterflies. They are
PARADISE, a term principally used for the garden of Eden, in which Adam and Eve were placed immediately upon their creation.

As to this terrestrial paradise, there have been many inquiries about its situation. It has been placed in the third heaven, in the orb of the moon, in the moon itself, in the middle region of the air, above the earth, under the earth, in the place poofled by the Capfian sea, and under the artice pole. The learned Huetius places it upon the river that is produced by the conjunction of the Tigris and Euphrates, now called the river of the Arabs, between this conjunction and the division made by the same river before it falls into the Perian sea. Other geographers have placed it in Armenia, between the sources of the Tigris, the Euphrates, the Araxis, and the Phafis, which they suppose to be the four rivers described by Moses.

The celestial paradise is that place of pure and refined delight, in which the souls of the bleffed enjoy everlasting happiness.

Bird of Paradise. See Paradisea.

PARADOX, in philosophy, a proposition seemingly absurd, as being contrary to fome received opinion, but yet true in fact.

No science abounds more with paradoxes than geometry: thus, that a right line fhould continually approach to the hyperbola, and yet never reach it, is a true paradox; and in the fame manner, a spiral may continually approach to a point, and yet not reach it, in any number of revolutions, however great.

PARÆA, in zoology. See Coluber.

PARAGOGOGE, in grammar, a figure whereby a letter or syllable is added to the end of a word; as med, for me; dicier, for dici, &c.

PARAGUAY, or La Plata, a province of South America, subject to Spain, lies between 12° and 35° S. lat. and between 50° and 75° W. long.

PARALIPOMENA, in matters of literature, denotes a supplement of things omitted in a preceding work.

PARALLACTIC, in general, fomething relating to the hyperbola, and yet never reach it, is a true paradox; and in the same manner, a spiral may continually approach to a point, and yet not reach it, in any number of revolutions, however great.

PARALLELA, in zology. See Coluber.

PARAPHRASE, an explanation of some text, in clearer and more ample terms, whereby is supplied what the author might have said or thought on the subject; such are esteemed Erasmus's paraphrase on the New Testament, the Chaldee paraphrase on the Pentateuch, &c.

PARALLELOPIPED, in geometry, a regular solid comprised under six parallelograms, the opposite ones whereof are similar, parallel, and equal.

PARALLELLOGRAM, in geometry, a quadrilateral right-lined figure, whose opposite sides are parallel and equal to each other.

PARALLELOPIPEDIA, in natural history, the name of a genus of spars, thus called, because regularly of a paralleloped form.

They are pellucid crystalline spars externally of a determinate and regular figure, always found loose, detached, and separate from all other bodies, and in form of an oblique paralleloped, with six parallelogram sides and eight solid angles, easily fitlfe either in an horizontal or perpendicular direction, being composed of numbers of thin plates, and those of very elegantly and regularly arranged bodies, each of the same form with the whole mass, except that they are thinner in proportion to their horizontal planes; and naturally fall into these and no other figures, on being broken with a light blow.

PARALOGISM, in logic, a false reasoning, or a fault committed in demonstration, when a consequence is drawn from principles that are false, or, though true, are not proved; or when a proposition is passed over that should have been proved by the way.

PARALYSIS, the Palsy. See Medicine, p. 97.

PARAMECIA, in natural history, a name given to fuch animalcules as have no visible limbs or tails, and are of an irregularly oblong figure.

PARAMETER, in conic fections, a conftant line, otherwise called latus rectum. See Conic Sections.

PARAMOUNT, in law, signifies the supreme lord of the fee.

PARANYMPH, among the ancients, the perfon who waited on the bridegroom, and directed the nuptial solemnities; called allo prounus, and auffpex, because the ceremonies began by taking auspícia. As the paranymp officiated only on the part of the bridegroom, a woman called prouna officiated on the part of the bride.

PARAPET, in fortification, an elevation of earth designed for covering the soldiers from the enemies cannon or small shot. See Fortification.

PARAPHERNAL goods in Scots law. See Law, Tit. vi. 8.

PARAPHIMOSIS, in medicine, a disorder in the penis, wherein the prepuce is shrunken, and withdrawn behind the glans, so as not to be capable of being brought to cover the same; which generally happens in venereal disorders. See Medicine.

PARAPHRASE, an explanation of some text, in clearer and more ample terms, whereby is supplied what the author might have said or thought on the subject; such are esteemed Erasmus's paraphrase on the New Testament, the Chaldee paraphrase on the Pentateuch, &c.

PARAPHERNIALIS, in medicine, an inflammation of the diaphragm. See Medicine.

PARAPHROSYNE, a word used by medical writers to express a delirium, or an alienation of mind in fevers, or from whatever cause.

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PARAPLEGIA, a species of palsy. See Medicine.

PARASELENE, in physiology, a mock moon, a meteor, or phenomenon, encompassing, or adjacent to, the moon, in form of a luminous ring; wherein are sometimes observed, sometimes two, apparent images of the moon.

PARASITE, among the Greeks, was originally a very reputable title; the parasites being a kind of priests, at least ministers, of the gods, in the same manner as the Epulones were at Rome. They took care of the sacred corn, or the corn defined for the service of the temples, and the gods, viz. sacrifices, feasts; &c. they had even the intention over sacrifices, and took care that they were duly performed. At Athens, there was a kind of college of twelve parasites; each people of Attica furnishing one, who was always chosen out of the best families. Polybios adds, that a parasite was also an honourable title among the ancient Gauls, and was given to their poets; but of late it has been made a term of reproach, and used for a flatterer and mean dependant.

PARASITES, or parasitical plants, in botany, such plants as are produced out of the trunk or branches of other plants, from whence they receive their nourishment, and will not grow upon the ground, as the misleto.

PARASTATÆ, in anatomy. See Anatomy, p. 270.

PARASYNANCHE, in medicine, a kind of angina, or quinsy. See Medicine, p. 83.

PARATHENAR, in anatomy. See Anat. p. 212.

PARBUNCLE, in a ship, the name of a rope almost like a pair of strings: it is seizing both ends together, and then put double about any heavy thing that is to be hoisted in or out of the ship; having the hook of the runner hitched into it, to hoist it up by.

PARCE, in the heathen mythology, goddesses, who were supposed to preside over the accidents and events, and to determine the date or period, of human life. See Mythology.

PARCHMENT, the skins of sheep or goats prepared after such a manner as to render it proper for writing upon, covering books, &c.

The manufacture of parchment is begun by the skinner, and finished by the parchment-maker.

The skin having been stripped of its wool, and placed in the lime pit, the skinner flretches it on a kind of frame, and pares off the flesh with an iron instrument: this done, it is moistened with a rag; and powdered chalk being spread over it, the skinner takes a large pumice-stone, flat at bottom, and rubs over the skin, and thus scours off the flesh: he then goes over it again with the iron instrument, moistens it as before, and rubs it again with the pumice-stone without any chalk underneath: this smooths and softens the flesh-side very considerably. He then drains it again, by pausing over it the iron instrument as before. The flesh-side being thus drained, by foraping off the moisture, he in the same manner pales the iron over the wool or hair side: then stretches it tight on a frame, and scographs the flesh-side again; this finishes its draining; and the more it is drained, the whiter it becomes. The skinner now throws on more chalk, sweeping it over with a piece of lamb skin that has the wool on; and this smooths it still farther. It is now left to dry; and when dried, taken off the frame, by cutting it all round. The skin, thus far prepared by the skinner, is taken out of his hands by the parchment-maker: who first, while it is dry, pares it on a summer (which is a calf skin stretched in a frame) with a sharper instrument than that used by the skinner, and, working with the arm from the top to the bottom of the skin, takes away about one half of its thickness. The skin, thus equally pared on the flesh-side, is again rendered smooth, by being rubbed with the pumice-stone on a bench covered with a sack stuffed with flocks, which leaves the parchment in a condition fit for writing upon. The prings thus taken off the leather, are used in making glue, size, &c.

What is called vellum, is only parchment made of the skins of abortives, or at least fucking calves. This has a much finer grain, and is whiter and smoother than parchment; but is prepared in the same manner, except its not being passed through the lime-pit.

PARDALUS. See Leo.

PAREGORICS in pharmacy, medicines that affwage pain, otherwise called analogues.

PAREIRA BRAVA, in the materia medica, a kind of oblong and large root, brought from the Brazilis.

It is certainly a diuretic of no mean character, and has done great service in nephritic cases; and in pleurises and quinteys it has been attended with more success than almost any medicine we know of singly.

PARELCON, in grammar, a figure by which a word or syllable is added to the end of another.

PAREMOBLE, in rhetoric, a figure wherein something relating to the subject is inferred in the middle of a period. All the differences between the parembole and parenthesis, according to Voilius, is, that the former relates to the subject in hand, whereas the latter is foreign to it.

PARENCHYMA, in anatomy, a term introduced by Eratitrus, signifying all that substance which is contained in the interstices between the blood vessels of the vifeera, which he imagined to be extravaated and concreted blood.

PAREMBOLE. See Agriculture.

PARENTHESIS, in grammar, certain intercalary words, inserted in a discourse, which interrupt the sense, or thread, but seem necessary for the better understanding of the subject.

PARENT, a term of relation applicable to those from whom we immediately receive our being.

PARENTALIA, in antiquity, funeral obsequies, or the last duties paid by children to their deceased parents.

PARENTHESES, in grammar, certain intercalary words, inserted in a discourse, which interrupt the sense, or thread, but seem necessary for the better understanding of the subject.

PARENZO, or PIRENZO, a port-town of Ilflia, in the territory of Venice, situated on a bay of the gulph of Venice, twenty-five miles south of Cabo de Ilfria.

PARESIS, in medicine, is defined to be a palsy of the bladder, wherein the urine is either suppressed, or discharged involuntarily.

PARETONIUM, in natural history, the name of an earth

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PARENZO, or PIRENZO, a port-town of Ilfria, in the territory of Venice, situated on a bay of the gulph of Venice, twenty-five miles south of Cabo de Ilfria.
PARHELION, or PARHELUM, in physiology, a mock sun, or meteor, in form of a very bright light, appearing on one side of the sun.

The parhelia are formed by the reflection of the sun's beams on a cloud properly poised. They usually accompany the corona, or luminous circles, and are placed in the same circumference and at the same height. Their colours resemble that of the rainbow, the red and yellow are on the side towards the sun, and the blue and violet on the other. There are corona sometimes seen without parhelia, and vice versa.

Parhelia are double, triple, &c. and in 1629 a parhelion of five suns was seen at Rome, and in 1666 another at Arles of six.

M. Mariotta accounts for parhelia from an infinity of little particles of ice floating in the air, that multiply the image of the sun by refraction or reflection; and by a geometrical calculus he has determined the precise figure of these little icicles, their situation in the air, and the size of the corona of circles which accompany the parhelia, and the colours wherewith they are painted.

PARIA, a lake of Peru, in South America, in the province of Los Charcas, situated in 67° W. long. and 22° S. lat.

PARIETALIA ossa, in anatomy. See Anatomy, p. 154.

PARIETARIA, in botany, a genus of the polygama mo-nocla glass. The calix, both in the female and hermaphrodite, consists of four segments; none of them have any corolla; the hermaphrodite has four flamina; and both have one style, and one long seed. There are six species, only one of them, viz. the officinalis, or pellicaria, of London.

PARIETARIA, or PARHELION, in botany, a genus of the polygama monogna glass. The calix consists of four leaves, and the corolla of four narrow petals; and the berry has four cells. There is but one species, viz. the quadrifolia, herb-paris, or true-love, a native of Britain. It is esteemed an excellent and abortifacient.

PARIS, in botany, a genus of the octandria trigynia glass. The calyx consists of four leaves, and the corolla of four narrow petals; and the berry has four cells. There is but one species, viz. the quadrifolia, herb-paris, or true-love, a native of Britain.

Paris, in geography, the metropolis of the kingdom of France, and of the principality or government of the Isle of France, situated in E. long. 20° 25', N. lat. 48° 50', two hundred miles south-east of London, six hundred and eighty north-east of Madrid, five hundred and fifty west of Vienna, one thousand three hundred north-west of Conflantinople, and seven hundred north-west of Rome.

PARISH, the precinct of a parochial church, or a circuit of ground inhabited by people who belong to one church and are under the particular charge of its minister.

PARK, a large inclosure privileged for wild beasts of chase, either by prescription or the king's grant.

PARKINSONIA, in botany, a genus of the decandria monogynia glass. The calix consists of four segments, and the corolla of four oval petals, the lowest being kidney-shaped; it has no style; and the pod is cylindrical.

PARLEY, a conference with an enemy. Hence to beat or found a parley, is to give a signal for holding such a conference by beat of drum or sound of trumpet.

PARLIAMENT, is the grand assembly of the three estates of this kingdom, summoned together, by the king's authority, to consult of matters relating to the public welfare, and particularly to enact and repeal laws. It consists of the king, the lords spiritual and temporal, and the commons, and is at once the seat of the legislative authority, and the highest court of justice in Great Britain. In the house of lords, criminal causes are tried on the impeachment of the commons; and this house has an original jurisdiction for the trial of peers upon incriminations found by a grand jury; the lords likewise try such causes as come thither on appeals from the court of chancery, and all their decrees are as judgments. The house of commons examine the right of elections; regulate disputes concerning them; may expel their own members, and commit them to prison. They are the grand inquest of the nation; and present public grievances or delinquents to the king and lords, in order to their being punished. In short, they are the representatives of all the commons in the kingdom; and in them their constituents have placed the highest confidence, by inveting them with the power of making laws, and entrusting them with all their liberties and privileges.

Originally, new parliaments were called every year; but by degrees their term grew longer. In the reign of king Charles II. they were held a long time, with great interruptions between: but both methods were found of such ill consequence, that, in the beginning of the reign of king William III. an act was passed, by which the term of all parliaments was restrained to three sessions, or three years; this was hence called the triennial act; but since that time, from other views, the period of parliaments has been lengthened to seven years. A parliament is called by the king's writ or letter directed to each lord, commanding him to appear; and by other writs, directed to the sheriffs of each county, to summon the people to elect two knights for each county, and one or two burgesses for each borough. The number of the members in the house of lords is uncertain, as increasing at the king's pleasure. The members of the house of commons, when full, are five hundred and fifty-three; viz. ninety-two knights of the shires; fifty-two deputies for twenty-five cities, London having four; sixteen for the eight cinque-ports; two for each university; three hundred and thirty-two for an hundred and eighty boroughs; twelve for the boroughs in Wales, and forty-five members for Scotland. If three hundred of these members are not, it is reckoned a full house; and forty may compose a house for the dispatch of business.

Upon the holding of a parliament, the king, the first day, sits in the upper-house, under a canopy, with the crown on his head, and dressed in his royal robes; and there, by himself, or the lord chancellor, declares the reasons of their meeting, in the presence of both the lords and commons; and then the commons are required to chuse a speaker, who is presented to the king, and being approved by his majesty, the buifiness of the parliament goes on.

The lords and commons sit each in a distinct apartment: in the house of lords, the princes of the blood fit by themselves on the sides of the throne; the wall, on the king's right hand, the two archbishops sit by themselves on a form. Below them, the bishops of London, Durham, and Winchester, and all the other bishops, sit according to the priority of their consecration. On the king's left hand the lord-treasurer, lord president, and lord privy-seal, sit upon forms above all dukes, except the royal blood; then the dukes, marquisses, and earls, according...
Anciently all the people had votes in elections, till it was enacted by Henry VI. that none but freeholders, who had a yearly revenue of forty shillings, should be admitted to vote for knights of the shire.

The manner of debating upon, and passing bills in parliament, is as follows: Any member may move to have a bill brought in, which, upon a question put, being agreed to by the majority, this person, with others, is ordered to prepare and bring in the same. When it is ready, a time is appointed for its being read; and after the clerk's reading it, the speaker reads an abstract of it, and puts the question whether or no it shall have a second reading; and after a second reading, the question is put whether or no it shall be committed, which is either to a committee of the whole house if it be of importance, or to a private committee, any member naming the persons. The committee being appointed, and a chairman chosen, the chairman reads the bill paragraph by paragraph, puts every clause to the question, fills up the blanks, and makes amendments, according to the opinion of the majority. The bill thus gone through, the chairman makes his report at the side-bar of the house, reads all the additions and amendments, &c. and moves for leave to bring up the report to the table; which granted, he delivers it to the clerk, who reads the amendments, &c. The speaker then puts the question whether they shall be read a second time; and, if agreed to, he reads them himself. To so many of the amendments as the house acquiesces in, the question is now put. Whether the bill, thus amended, shall be ingrossed and written fair upon parchment, and read a third time? and the bill being ingrossed, the speaker puts the question whether or no it shall be committed, which is either to a committee of the whole house if it be of importance, or to a private committee, any member naming the persons. The committee being appointed, and a chairman chosen, the chairman reads the bill paragraph by paragraph, puts every clause to the question, fills up the blanks, and makes amendments, according to the opinion of the majority. The bill thus gone through, the chairman makes his report at the side-bar of the house, reads all the additions and amendments, &c. and moves for leave to bring up the report to the table; which granted, he delivers it to the clerk, who reads the amendments, &c. The speaker then puts the question whether they shall be read a second time; and, if agreed to, he reads them himself. To so many of the amendments as the house acquiesces in, the question is now put. Whether the bill, thus amended, shall be ingrossed and written fair upon parchment, and read a third time? and the bill being ingrossed, the speaker holds it in his hand, and asks if it shall pass. If the majority be for it, the clerk writes on it, Soit bâlie aux seigneurs, "Let it be delivered to the lords;" or if in the house of lords, Soit bâlie aux communes, "Let it be delivered to the commons." If a bill be rejected, it cannot be any more proposed during that session. A bill for a general pardon has but one reading.

When a member of the house of commons speaks, he stands up uncovered, and directs his speech to the speaker only. If what he says be answered by another, he is not allowed to reply the same day, unless personal reflections have been cast upon him: but when the commons, in order to have a greater freedom of debate, have resolved themselves into a committee of the whole house, every member may speak to a question as often as he thinks necessary. In the house of lords they vote, beginning at the pulpit, or lowest baron and so upwardsly to the highest, every one answering Content or Not content. In the house of commons they vote by yes and nays; and if it be dubious which are the greater number, the house divides. If the question be about bringing any thing into the house, the yes go out; but if it be about any thing the house already has, the nays go out. In all divisions the speaker appoints four tellers, two of each opinion. In a committee of the whole house, they divide by changing sides, the yes taking the right and the nays the left of the chair; and then there are but two tellers. If a bill passes one house, and the other demur to it, a conference is demanded in the painted chamber, where certain members are deputed from each house; and here the lords sit covered, and the commons stand bare and debate the case. If they disagree, the affair is null; but if they agree,
Parliaments of France, are sovereign courts, established by the king, finally to determine all disputes between particular persons, and to pronounce on appeals from decisions given by inferior judges. There are ten of these parliaments in France, of which that of Paris is the chief, its privileges and jurisdiction being of the greatest extent. It consists of six chambers, viz. the grand chamber, where causes of audience are pleaded; and five chambers of inquiry, where processe are adjudged in writing. This parliament enjoys the privileges of verifying and registering the king's arrests or edicts, without which those edicts are of little or no value.

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Parliaments of Sweden, consists of four estates, with the king at their head: these estates are, 1. The nobility and representatives of the gentry; with whom the colonels, lieutenant-colonels, majors, and captains of every regiment, sit and vote. 2. The clergy; one of which body is elected from every rural deanery of ten parishes; who, with the bishops and superintendents, amount to about two hundred. 3. The burghers, elected by the magistrates and council of every corporation as their representatives, of whom there are four for Stockholm, and two for every other town, amounting in the whole to about an hundred and fifty. 4. The peasants, chosen by the peasants out of every district; who chuse one of their own rank, and not a gentleman, to represent them: these amount to about two hundred and fifty.

All these generally meet at Stockholm; and after the state-affairs have been represented to them from the throne, they separate, and sit in four several chambers or houses, in each of which affairs are carried on by majority of votes; and every chamber has a negative in the passing any law.

Parma, the capital of the duchy of Parma, in Italy, sixty miles north-east of Genoa, is pleasantly situated on a river to which it gives name: E. long. 11°, N. lat. 44° 45'.

Parnassia, in botany, a genus of the pentandria tetraclase. The calix consists of five segments, and the corolla of five petals; it has five coccid nectaria, with round buttons on their points; and the capsule has four valves. There is but one species, viz. the palustris, or grass of Parnassus, a native of Britain.

Parnassus, a mountain of Greece, much celebrated by ancient poets, situated near Calipso in Livadia.

Parody, a popular maxim, adage, or proverb. Parody is also a poetical pleasantry, consisting in applying the verses written on one subject, by way of ridicule to another; or in turning a serious work into a burlesque, by affecting to observe, as nearly as possible, the same rhymes, words, and cadences.

Paronomasia, in rhetoric, a pun; or a figure whereby words nearly alike in sound, but of very different meanings, are affectedly or designedly used.

Paros, one of the smallest islands of the Cyclades, famous for its marble, situated in E. long. 25° 30', N. lat. 36° 30'.

Parotides, in anatomy. See Anatomy, p. 270.

Paroxysm, in medicine, the severe fit of a disease, unburdeous for its marble, situated in E. long. 25° 30', N. lat. 36° 30'.

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an assemblage of which constitute all natural bodies.

It is the various arrangement and texture of these particles, with the difference of cohesion, &c. that constitute the various kinds of bodies. The smallest particles cohere with the flongest attraction, and compose bigger particles of weaker cohesion; and many of these cohering compose bigger particles, whose vigour is still weaker; and hereunto the operations in chemistry, and the colours of natural bodies, depend, and which, by cohering, compose bodies of sensibles bulk. The cohesion of the particles of matter, the Epicureans imagined, was effected by means of hooked atoms; the Aristotelians, by rest; but Sir Isaac Newton shews, that it is done by means of a certain power, whereby the particles mutually attract and tend towards each other. By this attraction of the particles, he shews, that most of the phenomena of the lesser bodies are affected, as those of the heavenly bodies are, by the attraction of gravity.

Particle, in grammar, a denomination for all those small words that tie or unite others together, or that express the modes or manners of words. See Grammar.

Partner, and Partnership. See Arithmetic, p. 386.

Partridge, in ornithology. See Tetrao.

Parturition. See Delivery.

Parulides, in surgery, tumours and inflammations of the gums, commonly called gum-boils.

They are to be treated with diffuents, like other inflammatory tumours.

Parus, in ornithology. See Certhia.

Paschal, something belonging to the passover or easter. See Passover, and Easter.

Paisley, a town of Scotland, in the county of Renfrew, six miles west of Glasgow.

Pasquin, a mutilated statue at Rome, in a corner of the palace of the Ursini: it takes its name from a cobbler of that city called Pasquin, famous for his screeers and gibes, and who diverted himself with paffing his jokes on all the people who went through that street. After his death, as they were digging up the pavement before his shop, they found in the earth the statue of an ancient gladiator, well cut, but maimed, and half spoiled: this they set up as they were digging up the pavement before his shop, six miles west of Glasgow.

Pasquinade, a satirical libel fastened to the statue of Pasquin: these are commonly short, merry, and pointed; and from hence the term has been applied to all other lampoons of the same cast.

Passade, in the menage, is a turn or course of a horse backwards or forwards, on the same spot of ground.

Birds of Passage, a name given to those birds which at certain stated seasons of the year remove from certain countries, and at other stated times return to them again, as our quails, woodcocks, storks, nightingales, swallows, and many other species. Among the birds of passage, the fieldfare, the redwing, the woodcock, and the snipe, come to us in the autumn, at the time when the summer-birds are leaving us, and go from us again in spring, at the time when these return; and of these the two last often continue with us through the summer, and breed: so that the two first seem the only kinds that certainly leave us at the approach of spring, retiring to the northern parts of the continent, where they live during the summer, and breed; and at the return of winter, are driven southerly from these frigid climates, in search of food, which there the ice and snow must deprive them of.

Passant, in heraldry, a term applied to a lion, or other animal, in a shield, appearing to walk leisurely: for most beasts, except lions, the term trippant is frequently used instead of passant.

Passao, or Cape Passao, a promontory of Peru, just under the equator: W. long. 81°.

Passau, the capital of the bishopric of the same name, in the circle of Bavaria, situated on the confluence of the rivers Danube, Inn, and Ills: E. long. 13° 30', N. lat. 48° 30'.

Passerina, in botany, a genus of the gynia class. It has no calix; the corolla consists of four segments, and the filament lie upon the tube. There are eight species, none of them natives of Britain.

Passiflora, in botany, a genus of the gynandria pentagyna class. It has three filii; the calix consists of five leaves, and the corolla of five petals; and the nectarium is a corona; and the berry is supported on a pedicle. There are 26 species, none of them natives of Britain, but are cultivated in gardens for the beauty of their flowers.

Passions, in medical philosophy, make one of the non-naturals, and produce very sensible effects. Joy, anger, and fear,
are the principal. In the two first, the spirits are hurried with too great vivacity; whereas, in fear or dread, they are is it we were curb'd and concentrac'd: whence we may conclude, that they have a very bad effect upon health; and therefore it will be best to keep them within bounds as much as possible, and to preferve an inward serenity, calmness, and tranquillity.

Passions, in painting, are the external expressions of the different dispositions and affections of the mind; but particularly their different effects upon the several features of the face: for though the arms, and indeed every part of the body, serve likewise, by their quick, languid, and variously diversified motions, to express the passions of the soul; yet, in painting, this difference is moft conspicuous in the face.

In sorrow, joy, love, shame, and compassion, the eyes swell all of a sudden, are covered with a superabundant moisture, and drop tears; and in grief especially, the corners of the mouth hang down, the eye-lids are half shut, and the pupil of the eye is elevated and half covered; and all the other muscles of the face are relaxed, so that the visage appears longer than ordinary.

In fear, terror, fright, and horror, the eye-brows are greatly elevated; the eye-lids are expanded as wide as possible, so as to discover the white of the eye; and the pupil is depressed, and half covered by the lower eye-lid; the hair stands an end; the mouth is at the same time wide open; and the lips so far drawn back, that the teeth both of the upper and under jaw appear.

Contempt is expressed by raising one side of the upper lip, so as to discover the teeth, whilst the other side has a movement like that in laughter; the eye, on that side where the teeth appear, is half shut, whilst the other remains open; however, both the pupils are depressed.

In jealousy, envy, hatred, and malice, the eye brows are knit; and, in laughter, all the parts agree, tending as it were towards the centre of the face.

Passion, or cross of the Passion, in heraldry, is so called, because resembling the shape of that on which our Saviour is thought to have suffered; that is, not crossed in the middle, but a little below the top, with arms short in proportion to the length of the shaft. See plate CXXXIV. fig. 12.

Passion-flower, in botany. See Passiflora.

Passion-week, the week immediately preceding the festival of Easter: so called, because in that week our Saviour's passion and death happened.

The Thursday of this week is called MaundayThursday; the Friday, Good Friday; and the Saturday, the great Sabbath.

Passive, in general, denotes something that suffers the action of another called an agent or active power.

In grammar, the verb or word that expresses this passion, is termed a passive verb: which, in the learned languages, has a peculiar termination, as amor, doreor, &c. in Latin.


Passover, a solemn festival of the Jews, celebrated on the fourteenth day of the month next after the vernal equinox, and instituted in commemoration of their coming out of Egypt; because on the night before their departure the destroying angel, who put to death the first born of the Egyptians, pass'd over the houses of the Hebrews; which were sprinkled with the blood of a lamb. The whole transaction is related in the twelfth chapter of Exodus.
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PATAGONIA, the most southern part of South America, extending from the mouth of the River di la Plata, in 36° of S. lat. to Cape Horn, in 55° 30'.

PATAGONULA, or Patagonica, in botany, a genus of the pteridaria monogynia class. The corolla is rotated; and the stylus is dichotomous. There is but one species, a native of America.

PATAVITY, among critics, denotes a peculiarity of Livy's diction, derived from Patavium, or Padua, the place of his nativity; but wherein this patavity consists, they are by no means agreed.

PATH, in general, denotes the course or track marked out; or run over by a body in motion. For the path of the moon, &c. see Astronomy, p. 465.

PATHETIC, whatever relates to the passions, or that is proper to excite or awake them.

PATHOGENOMONIC, among physicians, an appellation for a symptom, or concourse of symptoms, that are inseparable from a distemper, and are found in that only, and in no other.

PATHOLOGY, that part of medicine, which explains the nature of diseases, their causes and symptoms.

PATHOS, a Greek term, literally signifying passion, is sometimes used for the energy of a discourse, or its power to move the passions.

PATMOS, one of the isle of the islands of the Archipelago, subject to the Turks: E. long. 27°; and N. lat. 37°.

PATNA, a city of the hither India, the capital of the territory of the same name, in the province of Bengal: E. long. 85°; and N. lat. 26°.

PATANCE, in heraldry, is a cross, florid at the ends; from which it differs only in this, that the ends, instead of turning down like a fleur-de-lis, are extended somewhat in the pattee-form. See FLOWERY.

PATOMAC, a great river of Virginia, which arises in the Apalachian mountains, and after separating Virginia from Maryland falls into the bay of Chesapeake.

PATRAS, a city and port-town of European Turkey, in the province of the Morea: E. long. 21° 30'; and N. lat. 38° 20'.

PATURE PATRATUS, in Roman antiquity, the principal place of his nativity; but wherein this patavity consists, they are by no means agreed.

PATER NOSTER, the Lord's prayer, so called from the author and head of the Sabellians, and others. The author and head of the patripassians was Praxeas, a philosopher of Phrygia.

PATEGUA, or Patiique, a city of Mexico, W. long. 103°; N. lat. 21°; subject to Spain.

PATE, in fortification, a kind of platform, resembling what is called a horse-shoe.

PATEE, or Patte'e, in heraldry, a cross, small in the centre, and widening to the extremities, which are very broad. See Plate CXXXIV. fig. 13. which is a cross patee, argent, upon a field sable.

PATELLA, in anatomy. See Anatomy, p. 185.

PATELLA, the LIMPET, is a genus of invertebrates belonging to the order of vermes telesaeae. It is an animal of the final kind; the shell consists of one conical valve, without any spiral. There are 36 species, principally distinguished by peculiarities in their shells.

PATENT, in general, denotes something that stands open or expanded: thus a leaf is said to be patent when it stands almost at right angles with the stalk.

PATENT, or LETTERS-PATENT. See LETTER.

PATER PATRATUS, in Roman antiquity, the principal person among the seculae or college of heralds.

PATER NOSTER, the Lord's-prayer, so called from his ancestors.

PATTERINGTON, a market-town of Yorkshire, situated at the mouth of the Humber, fifty miles east of York.

PATRIPASSIANS, in church-history, a Christian sect, which appeared about the latter end of the IIth century; so called from their ascribing the passion to the Father: for they ascribed the unity of God in such a manner as to delireously all distinction of persons, and to make the Father and Son precisely the same; in which they were followed by the Sabellians, and others. The author and head of the patripassians was Praxeas, a philosopher of Phrygia in Asia.

PATROL, in war, a round or march made by the guards, or watch, in the night-time, to observe what passes in the streets, and to secure the peace and tranquility of a city or camp.

PATRON, among the Romans, was an appellation given to a master who had freed his slave. As soon as the relation of master expired, that of patron began; for the Romans, in giving the slaves their freedom, did not deprive themselves of all right and privileges in them; the law still subjected them to considerable services and duties towards their patrons, the neglect of which was very severely punished.

PATRON, in the church of Rome, a saint, whose name a perfon bears, or under whose protection he is put, and whom he takes particular care to invoke; or a saint, in whose name a church or order is founded.
PAULTNIA, in botany, a genus of the odtandria trigy-

PAVETTA, in botany, a genus of the tetrandria mono-

Pavo, in astroBomy. See Astronomy, p. 487.

PAULICIANS, Chriftian heretics of the Vllth century, 

PAULIONISTS, in churcb-hiftory, Chriftian heretics of 

PAVIA, a city of Italy, in the duchy of Milan, capital of 

PAVO, in ornithology, a genus belonging to the order of 

PATRONYMIC, among^ grammarians, is applied to fuch 

PAUSANIA, in Grecian antiqwty, a felfival. in which 

PATRONAGE, the right of difpofing a church or benefice, 

Patrol, in Scots law. See Law, Tit. v. j, 

Arms of Patronage, in heraldry, are thofe on the top 

Pavia, in botany. See AAculus 

PAU (4^3) PEA 

PEARL, in natural hiftory, a hard, white, finning body, 

PEARCH, in ichthyology. See Perca.

PEAR, in botany. See Pyrus.

PEACH, in botany. See Amydalus.

PEACOCK, in ornithology. See Pavo.

PEAK, a rocky mountainous country in the wed of Der-

PEAN, in heraldry, is when the field of a coat of arms is 

Peach-glue, the name of a kind of glue of remarkable 

PEARLS, though esteemed of the number of gems by 

Pears, though efteemed of the number of gems by 

PEARL, in natural hisory, a hard, white, finning body, 

PEARL, in botany. See Amydalus.

PEARL, in botany. See Pyrus.

PEARL, in botany. See Amydalus.

Pearl-glue, the name of a kind of glue of remarkable 

PEARL, in natural history, a hard, white, finning body, 

PEARL, in natural hisory, a hard, white, finning body, 

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PARK, in the menage. A horfe is fard to paw the ground,

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April, and the last in August and September; and the more rain there falls in the year, the more plentiful are these fisheries. At the beginning of the season there are sometimes two hundred and fifty barks on the banks; the larger barks having two divers, and the smaller one. As soon as the barks arrive at the place where the fish lie, and have cast anchor, each diver binds a stone fix inches thick, and a foot long, under his body; which serves him as ballast, prevents his being driven away by the motion of the water, and enables him to walk more steadily under the waves. They also tie another very heavy stone to one foot, by which they are very speedily sent to the bottom of the sea: and as the oysters are usually firmly fixed, they arm their hands with leather mittens to prevent their being wounded in pulling them violently off; but this talk some perform with an iron rake. In the last place, each diver carries down with him a large net in the manner of a sack, tied to his neck by a long cord, the other end of which is fastened to the side of the bark. This net is to hold the oysters gathered from the rock, and the cord is to pull up the diver when his bag is full, or he wants air.

In this equipage he sometimes precipitates himself sixty feet under water; and as he has no time to lose, he no sooner arrives at the bottom, than he begins to run from side to side tearing up all the oysters he meets with, and cramming them into his budget.

At whatever depth the divers are, the light is so great, that they easily see whatever passeth in the sea: and to their great conformation sometimes perceive monstrous fishes, from which all their address in mudding the water, &c. will not always save them, but they unhappily become their prey: and of all the dangers of the fishery, this is one of the greatest and most usual. The bell divers will keep under water near half an hour, and the rest do not stay less than a quarter. During this time they hold their breath without the use of oils, or any other liquors; only acquiring the habit by long practice. When they find themselves fastened, they pull the rope to which the bag is fastened, and hold fast by it with both hands; when those in the bark, taking the signal, heave them up into the air, and unload them of their fish, which is sometimes five hundred oysters, and sometimes not above fifty. Some of the divers need a moment's respite to recover breath; others jump in again instantly, continuing this violent exercise without intermission for several hours.

On the shore they unload their barks, and lay their oysters in an infinite number of little pits dug in the sand four or five feet square; raising heaps of sand over them to the height of a man; and in this condition they are left, till the rain, wind, and sun have obliged them to open, which soon kills them: upon this the flesh rots and dries, and the pearls, thus disengaged, fall into the pit, on their taking out the shells. After clearing the pits of the großer fish, they sift the sand several times in order to find the pearl: but whatever care they take, they always lose a great many. After cleaning and drying the pearls, they are puffed through a kind of sieve, according to their sizes: the smallest are then sold as feed-pearls, and the rest put up to auction, and sold to the highest bidder.

Artificial Pearls, are made by reducing feed-pearls to a paste, by means of a chemical preparation called mercurial water, making the beads in silver-moulds, boring them with a hog's bristle, and drying them in a closed glass in the sun.

Beads, in imitation of pearls, are also made of wax, and covered with the scales of several kinds of fishes.

Mother of Pearl, is the shell, not of the pearl-oyster, but of another sea-fish of the oyster-kind. This fish on the inside is extremely smooth, and of the whiteness and water of pearl itself; and it has the same lustre on the outside, after the first laminae or scales have been cleared off with aquafortis and the lapidaries mill. Mother of pearl is used in inlaid works, and in several toys, as suffices, &c.

Pearl islands, several small islands situated in the bay of Panama; W. long. 81°, and between 7° and 9° of north lat.

PEAT, a kind of turf used for fuel in several countries.

PEBBLES, the name of a genus of fossils, distinguished from the flints and homochroa by their having a variety of colours. These are defined to be stones, composed of a crystalline matter, debased by earths of various kinds in the same species, and then subject to veins, clouds, and other variegations; usually formed by incrustations round a central nucleus, but sometimes the effect of a simple concretion, and veined like the agates, by the disposition the motion of the fluid they were formed in gave their differently coloured substanices.

PECCANT, in medicine, a term used for those humours of the body which offend either by their quantity or quality.

PECK, a measure of capacity, four of which make a bushel.

PECORA, in natural history, the name of a class of quadrupeds. See Natural History.

PECTORAL, an epithet for medicines good for disorders of the breast and lungs.

PECTORALIS, in anatomy. See Anatomy, p. 194. 195.

PECTORIS os, in anatomy. See Anatomy, p. 175.

PECULIUM, the stock or estate which a person in the power of another, as a slave, may acquire by his industry, the discipline and direction of a scholar.

PEDANT, is used for a rough unpollished man of letters, who makes an impertinent use of the sciences, and abounds in unseasonable criticisms and observations.

PEDARIAN, in Roman antiquity, those senators who signified their votes by their feet, not their tongues; that is, such as walked over to the fide of those whose opinion they approved of, in divisions of the house.

PEDESTAL, in architecture. See Architecture, p. 356.

PEDICLE, among botanists, that part of a flalk which immediately sustains the leaf of a flower or a fruit, and is commonly called, a foot-flalk.

PEDICULARIS, in botany, a genus of the didynamia angio sperma clafs. The calix consists of five segments; the capsule is sharp-pointed, oblique, and has two cells; and the seeds are covered with a tunic. There are 14 species, two of which are natives of Britain, viz. the sylvatica, or common louf-e-wort; and the palustris, or marsh louf-e-wort.

This plant is of a cooling and drying nature, whence
PEER, in general, signifies an equal, or one of the same kind of vermin, is cleanliness.

PEDILUVIUM, a bathing of the feet. This bath may either consist of light pure water alone; or, to correct the qualities of heavy and hard water, a lixivium or bran of wheat or chamomile-flowers may be added.

PEDIMENT, in architecture. See Architecture, p. 287.

PEEK, in the sea-language, is a word used in various senses. Thus the anchor is laid to be a peek, when the ship being about to weigh comes over her anchor in such a manner that the cable hangs perpendicularly betwixt the haufe and the anchor. To heave a peek is to bring the peek so as that the anchor may hang a peek.

PEER, in general, signifies an equal, or one of the same rank and station. The term peer is now applied to those who are impanelled in an inquest upon a perfon for convicting or acquitting him of any offence laid to his charge; and the reason why the jury is so called, is, because by the common law, and the custom of this kingdom, every perfon is to be tried by his peers or equals, a lord by the lords, and a commoner by commoners.

PEER OF THE REALM, a noble lord who has a seat and vote in the house of lords, which is also called the house of peers. These lords are called peers, because, though there is a distinction of degrees in our nobility, yet in public actions they are equal, as in their votes in parliament, and in trying any nobleman or other person impeached by the commons, &c. See Parliament.

PEERS OF FRANCE, the twelve great lords of that kingdom, of which six are dukes, and six counts; and of thefe, five are ecclesiastics, and six laymen: thus, the archbishop of Rheims, and the bishop of Laon and Langres are dukes and peers; and the bishops of Chalon on the Marn, Noyon, and Beauvais, are counts and peers. The dukes of Burgundy, Normandy, and Aquitain, are lay peers and dukes; and the counts of Flanders, Champaign, and Toloufe, lay peers and counts. These peers still assist at the coronation of kings, either in person or by their representatives, where each performs the functions attached to his respective dignity: but as the five lay peers are all at present united to the crown except that of the count of Flanders, six lords of the first quality are chosen to represent them; but the ecclesiastical peers usually assist in person. At present the title of peer is bestowed on every lord whose estate is erected into a peerage, the number of which is uncertain, and it depends entirely on the king.

PEERESS, a woman who is noble by descent, creation, or marriage.

If a peeress, by descent or creation, marries a person under the degree of nobility, the title continues noble; but if she obtains that dignity only by marriage, the loss of it on her afterwards marrying a commoner; yet, by the courtesy of England, she always retains the title of her nobility.

PEEVIT, in ornithology. See Larus.

PEGANUM, in botany, a genus of the dodecanidia monogynia class. The corolla consists of five petals, and the calyx of five leaves; the capsule has three cells, and three valves, containing many seeds. There are two species, none of them natives of Britain.

PEGASUS, in astronomy. See Astronomy, p. 487.

PEGU, the capital of the kingdom of Pegu, and situated upon a river of the same name, in 97° E. long. and N. lat. 17° 30'.

PEGUSUS, in astronomy. See Astronomy, p. 487.

PEKIN, the metropolis of the empire of China, is situated in E. long. 111°, and N. lat. 40°.

It is about twenty miles in circumference, and is said to contain 2,000,000 of people.

PELAGIANS, a Christian sect who appeared about the latter end of the fourth, or the beginning of the fifth century. Pelagius, the author of this sect, was born in Wales, and his name was Morgan, which in the Welsh language signifies sea-born; from whence he had his Latin name Pelagius. Some of our ancient historians pretend that he was abbot of Bangor; but this is impossible, because the British monasteries were of a later date. St Aulfin gives him the character of a very pious man, and a Christian of no vulgar rank: according to the same father, he travelled to Rome, where he associated himself with persons of the greatest learning and figure, and wrote his commentaries on St Paul's Epistles, and his letters to Melania and Demetrias; but being charged with herefy, he left Rome, and went into Africa, and from thence to Jerusalem, where he died. He died somewhere in the east; but where, is uncertain. He was charged with maintaining the following doctrines: 1. That Adam was by nature mortal, and, whether he had sinned or not, would certainly have died. 2. That the consequences of Adam's sin were confined to his own person. 3. That newborn infants are in the same condition with Adam before the fall. 4. That the law qualified men for the kingdom of heaven, and was founded upon equal promises with the gospel. 5. That the general resurrection of the dead does not follow in virtue of our Saviour's resurrection. 6. That the grace of God is given according to our merits. 7. That this grace is not granted for the performance of every moral act, the liberty of the will, and information in points of duty being sufficient, &c.

PELICANUS, in ornithology, a genus belonging to the order of anfears. The bill is straight, without teeth, and crooked at the point; the face is naked; and the feet are palmed. There are eight species, principally distinguished by the shape of their tails.

PELICAN, in ornithology. See Pelicanus.


PELLETS,
PENICILLUS, among surgeons, is used for a tent to be put into wounds or ulcers.

PENINSULA. In geography, a portion or extent of land, joining to the continent by a narrow neck or isthmus, the rest being encompassed with water.

PENS, in anatomy. See Anatomy, p. 270.

PENSCOLA, a port town of Spain, in the province of Valencia, situated on the Mediterranean, under the meridian of London, and in N. lat. 40° 29'.

PENNY, an ancient silver coin, which, though now little used, was the only one current among our Saxon ancestors.

PENNY EARTH, in agriculture, denotes a hard loamy, or sandy earth, with a large proportion of sea-shells intermixed with it.

PENNY-WEIGHT, a Troy-weight, containing twenty-four grains, each of which is equal in weight to a grain of wheat, gathered out of the middle of the ear, and well dried.

PENRISE, a port-town of Wales, in the county of Glamorgan, situated on Bristol Channel, seventeen miles south of Carmarthen.

PENRYN, a borough-town of Cornwall, near a bay of the English Channel: W. long. 5° 35', N. lat. 50° 20'. It sends two members to parliament.

PENNSANCE, a market-town of Cornwall, eight miles east of the Land's end.

PENNSILVANIA, one of the English plantations in America, two hundred miles in length, and almost as much in breadth: situated between 74 and 78° of well longitude, and between 39 and 42° of north latitude; a fine fruitful country, bounded by the five nations of the Iroquois on the north, by New-Jersey and New-York on the east, and by Maryland on the south and west. It is a proprietary government, the heirs of Mr. Penn, a quaker, who settled this country, appointing the governor.

PENSION, a sum of money paid annually for services or considerations already past. The yearly payment of each member to the house of the inn of courts, are likewise termed pensions; and the yearly assembly of the members of the society of Gray's Inn, to consult on the affairs of the house, is also called a pension.

PENSIONER, in general, denotes a person who receives a pension, yearly salary, or allowance. Hence, the band of gentleman-pensioners, the noblest fort of guard to the king's person, confists of forty gentlemen, who receive a yearly pension of one hundred pounds. This honourable band was first instituted by King Henry VIII and their office is to attend the king's person, with their battle-axes, to and from his chapel-royal, and to receive him in the presence chamber, or coming out of his privy-lodgings; they are also told to attend at all great solemnities, as coronations, St. George's feast, public audiences of ambassadors, at the sovereign's going to parliament.

They are each obliged to keep three double horses and a servant, and so are properly a troop of horse. They wait half a year, quarterly; but on Christmas-day, Easter-day, Whitsunday, &c. and on extraordinary occasions, they are all obliged to give their attendance.

PENTACROSISTIC, in poetry, a set of verses so disposed as that there are always five acrostics of the same name, in five divisions of each verse.

PENTAEDESTYSTILCA, in natural history, the name of a genus of spars. See Spar.
The bodies of this genus are sparse, in form of pentagonal columns, terminated by pentagonal pyramids at one end, and irregularly affixed at the other to some solid body.

PENTAGON, in geometry, a figure of five sides and five angles. See Geometry.

PENTAGRAM, an instrument whereby designs of any kind may be copied in what proportion you please, without being skilled in drawing.

PENTAMETER, in ancient poetry, a kind of verse consisting of five feet or metres; whence the name.

The two first feet may be either dactyls or spondees, at pleasure; the third is always a spondee, and the last anapestis.

PENTANDRIA, in botany. See Botany, p. 635.

PENTAPETALOUS, an appellation given to flowers that consist of five petals or leaves.

PENTAPETES, in botany, a genus of the monadelphia decandria class. The calix is simple; the capsule has five cells, containing many membranaceous seeds. There are three species, none of them natives of Britain.

PENTASTYLE, in architecture, a building wherein there are five rows of columns.

PENTATEUGH, an appellation given to the first five books of the Old Testament, viz. Genesis, Exodus, Leviticus, Numbers, and Deuteronomy, &c.

PENTATHLON, in antiquity, a general name for the five exercices performed at the Grecian games, viz. wrestling, boxing, leaping, running, and playing at the discus.

PENTECOST, a solemn festival of the Jews, so called because it was celebrated on the fiftieth day after the departure of the Israelites came out of Egypt.

PENTHORUM, in botany, a genus of the decandria pentagnia class. The calix consists of five segments; the petals are from five to nine; and the capsule has five cells. There is but one species, viz. the sedoides, a native of Virginia.

PENULTIMA, or PENULTIMATE SYLLABLE, in grammar, denotes the last syllable but one of a word, and hence the anti-penultimate syllable is the last but two, or that immediately before the penultima.

PENUMBRA, in astronomy, a partial shade observed between the perfect shadow and the full light in an eclipse. It arises from the magnitude of the sun's body; for were he but a luminous point, the shadow would be all perfect; but by reason of the diameter of the sun, it happens that a place which is not illuminated by the whole body of the sun does yet receive rays from a part thereof.

PEPLIS, in botany, a genus of the hexandria monogynia class. The perianthium is bell-shaped, with twelve segments; the petals are fixed, inserted into the calyx; and the capsule has two cells. There are two species, none of them natives of Britain.

PEPO, in botany. See Cucurbita.

PEPPER, in botany. See Piper.

PERAMBULATOR, in surveying, an instrument for measuring distances, called also penambulator, way-writer, and surveying wheel.

It consists of a wheel AA (Plate CXXXIV. fig. 15. n° 1.) two feet seven inches and a half in diameter; consequently half a pole, or eight feet three inches, in circumference. On one end of the axis is a nut, three quarters of an inch in diameter, and divided into eight teeth; which, upon moving the wheel round, fall into the eight teeth of another nut (ibid. n° 2.) fixed on one end of an iron-rod Q., and thus turn the rod once round in the time the wheel makes one revolution. This rod, lying along a groove in the side of the carriage of the instrument, under the dotted line, has at its other end a square hole, into which is fitted the end 6 of a small cylinder P. This cylinder is disposed (ibid. n° 3.) under the dial-plate of a movement, at the end of the carriage B, in such a manner as to be moveable about its axis: its end a is cut into a perpetual screw, which falling into the thirty-two teeth of a wheel wheel having perpendicularly thereto, upon driving the instrument forward, that wheel makes a revolution each sixteenth pole. On the axis of this wheel is a pinion with fix teeth, which, falling into the teeth of another wheel of fixty teeth, carries it round ever hundred and sixtieth pole, or half a mile.

This last wheel, carrying a hand or index round with it over the divisions of a dial-plate, whose outer limb is divided into one hundred and sixty parts, corresponding to the one hundred and fifty poles, points out the number of poles passed over. Again, on the axis of this last wheel is a pinion, containing twenty teeth, which falling into the teeth of a third wheel which hath forty teeth, drives it once round in three hundred and twenty poles, or a mile. On the axis of this wheel is a pinion of twelve teeth, which, falling into the teeth of a fourth wheel having seventy-two teeth, drives it once round in twelve miles.

This fourth wheel, carrying another index over the inner limb of the dial-plate, divided into twelve miles, and each mile subdivided into halves, quarters, and furthons, serves to register the revolutions of the other hand, an it to keep account of the half miles and miles passed over as far as twelve miles.

The use of this instrument is obvious from its construction. Its proper office is in the surveying of roads and large distances, where a great deal of expedition, and not much accuracy, is required. It is evident, that driving it along, and observing the hands, has the same effect as dragging the chain, and taking account of the chains and links.

Its advantages are its handiness and expedition; its contrivance is such, that it may be fitted to the wheel of a coach, in which state it performs its office, and measures the road without any trouble at all.

PERCA, the PEACh, in ichthyology, a genus belonging to the order of thoracici. The head is furnished with scaly and serrated opercula; there are seven rays in the membrane of the gills; and the fins on the back are prickly. There are 38 species, principally distinguished by peculiarities in the back fins.

PERCEPTION, in logic, the first and most simple act of the mind, whereby it perceives or is conscious of its ideas. See Logic.

PERCH. See PERCA.
PERIHELIUM. In agronomy, that point of a planet's or moon's orbit wherein it is in its least distance from the sun; in which sense it stands opposed to aphelium.

PERICRANIUM. In anatomy. See Anatomy, p. 279.

PERIGUEUX, a city of France, in the province of Gironde, capital of the territory of Perigord, situated on the river Lisle; in E. long. 7° 5', N. lat. 45° 1'.

PERIGRAPHIC. A word usually understood to express the white lines or impressions that appear in the musculus rectus of the abdomen.

PERIGEE, in astronomy, that point of the moon's orbit wherein it is in its least distance from the earth, in which sense it stands opposed to apogee.

PERICARPIUM, among botanists. See Botany, p. 637.

PERICHORUS, in antiquity, a name given by the Greeks to their profane games and combats, that is, to such as were not consecrated to any of the gods.

PERICRANIAL, in botany, applied to those plants whose roots will abide many years, whether they retain their leaves in winter or not; those which retain their leaves are called evergreens; but such as cast their leaves, are called deciduous, or peridifols.

PERFORATUS manus, in anatomy. See Anatomy, p. 201.

PERFORATUS pedis, in anatomy. See Anatomy, p. 211.

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PERFORATUS manus, in anatomy. See Anatomy, p. 201.

PERFORATUS pedis, in anatomy. See Anatomy, p. 211.

PERISTYLE, in ancient architecture, a building encompassed with a row of columns on the inside.

PERIODIC, or Periodical, something that terminates and comprehends a period; such is a periodic month, being the space of time wherein the moon dispatches her period.

PERIODICAL, in grammar, denotes a small compass of discourse containing a perfect sentence, and distinguished at the end by a point, or full stop, thus (.); and its members or divisions marked by commas, colons, &c.

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it, are punishable by fine, imprisonment, pillory, transportation, &c. See Law, Tit. xxxii. 34.

PERMEABLE, a term applied to bodies of loose and porous a structure, as to let something pass through them.

PERMUTATION, in commerce, the same with bartering.

PERORATION, in rhetoric, the epilogue, or last part of an oration, wherein what the orator had insisted on through his whole discourse, is urged afresh with greater vehemence and passion.

PERSPECTIVE teaches how to represent objects on a plane superficies, such as they would appear at a certain distance and height, upon a transparent plane perpendicular to the horizon, placed between the objects and the eye. In order to understand this subject, a general knowledge of the principles of Optics is absolutely necessary. The foundation of perspective...
The eye, however, being all the while opposite to the object, as it were, presents to us two sides or faces. The point of direct view, or of the front, is when we have the object directly before us; in which case, the eye sees the object laterally, and it presents to us two sides or faces.

The point of oblique view is, when we see an object a-side of us, and as it were slant, or with the corner of the eye; the eye, however, being all the while opposite to the point of view; in which case, we see the object laterally, and it presents to us two sides or faces.

The business of perspective, therefore, is to lay down geometrical rules for finding the points a, b, d, e, f, upon the plane; and hence also we have a mechanical method of delineating any object very accurately.

Perspective is either employed in representing the iconographies or ground plots of objects; or the scenographies, or representations of the objects themselves.

But before we give any examples of either, it will be proper to explain some technical terms in regard to perspective in general: and first, the horizontal line is that which is supposed to be drawn parallel to the horizon through the eye of the spectator; or rather it is a line which separates the heaven from the earth, and which limits the sight. Thus, A, B, (ibid. fig. 2) are two pillars below the horizontal line, CD; by reason the line is elevated above them; in fig. 3, they are laid to be equal with it, and in fig. 4, raised above it. Thus, according to the different points in view, the objects will be either higher or lower than the horizontal line. The point of sight A (ibid. fig. 5) is that which makes the central ray on the horizontal line ab; or, it is the point where all the other visual rays DD unite. The points of distance, C, C, are points let off in the horizontal line at equal distances on each side of the point of sight A; and in the same figure BB represents the base line, or fundamental line: EE is the abridgment of the square; of which DD, are the sides; F, F, the diagonal lines, which go to the points of distance C, C. Accidental points are those where the objects end: these may be call negligently; because neither drawn to the point of sight, nor to those of distance, but meeting each other in the horizontal line. For example, two pieces of square timber G and H (ibid. fig. 6) make the points I, I, I, I on the horizontal line; but go not to the point of sight K, nor to the points of distance C, C; these accidental points serve likewise for callimeters, doors, windows, tables, chairs, &c.

The point of direct view, or of the front, is when we have the object directly before us; in which case, it shews only the foreside; and, if below the horizon, a little of the top; but nothing of the sides, unless the object be polygonal. Thus the plan ABCD, (ibid. fig. 7) is all in front, and if it were raised we should not see any thing of the sides AB or CD, but only the front AD: the reason is, that the point of view E being directly opposite thereunto, causes a diminution on each side; which however is only to be understood where an elevation is the object; for it be a plan, it shews the whole, as ABCD.

The point of oblique view is, when we see an object a-side of us, and as it were slant, or with the corner of the eye; the eye, however, being all the while opposite to the point of view; in which case, we see the object laterally, and it presents to us two sides or faces.
Plate CXLII.

Phasianus Gallus
or common Cock & Hen.

Pavo cristatus
or Peacock.

Hen.
or raise the angle \( B^\circ \), and falling perpendicularly on \( BD \).

This being continued as a base line, lay your ruler on the side of the square \( AD \) and \( DC \), and where the ruler cuts the terrestrial line make the points \( H \) and \( I \).

Then from \( H \) and \( B \) draw lines to the point of distance \( P \); and from \( I \) draw a line to the other point of distance \( G \); and in the intersection of those lines, make points, which will give you the square \( KLMB \).

To do without the plan: set off the diameter each way from the middle point \( B \), as to \( H \) and \( I \). But in either case no line is to be drawn to the point of sight \( O \).

To diminish a Circle. See Plate CXLIII. fig. 13.

Draw a square \( ABCD \) about it, and from the angles \( AD \) and \( CB \) draw diagonals, dividing the circle into eight parts, and through the points where they cut it, draw lines from the base line perpendicular to \( DEF \).

Then draw two diagonals \( QR \), \( SP \), intersecting each other at right angles in the centre \( G \).

Having thus disposed the plan, draw lines from all the perpendiculars to the point of sight \( H \); and where they are intersected by the diagonals \( AK \) and \( BI \), make points; the two last of which \( M, N \) give the square, which is to be divided into four by diagonals, intersecting each other in the point \( P \).

In the left place, from the extremes of this cross, draw curve lines through the said points, which will give the form of the circle in perspective.

Of the measures upon the base in perspective. Pl. CXLIV.

By the base line alone any depth may be given, and in any place at pleasure, without the use of squares; which is a very expeditious way.

As for example, suppose the base line \( BS \), (fig. 1.) the point of view \( A \), and the points of distance \( DE \); if now you would make a plan of a cube \( BC \), draw two occult or dotted lines from the extremes \( BC \) to the point of sight; then to give the breadth, take the same measure \( BC \), and set it off from \( A \), as for instance, to \( P \), and then from \( P \) drawing a line to \( H \); and where this cuts the other parallels, will be formed the plan required; which you may make either round or square.

To find the height and proportion of any objects, as they appear above the horizon on a suppositious plane. See Plate CXLIV. fig. 3.

First rule your horizontal line \( NO \), and fix your point of sight, as at \( M \); then make the place of your nearest pillar, by making a dot for the base or bottom, as at \( A \); and another for the summit or top, as at \( B \); rule a line from \( A \) to the point of sight \( M \), and another from \( B \) to \( M \), and these two lines will give the height of any number of pillars. As for example: Suppose you would have a pillar at \( C \), fix your dot for the base, and rule from thence a parallel line to meet the diagonal \( AM \) at \( D \); then rule the perpendicular \( DE \) to the diagonal \( BM \); which perpendicular is the height of your figure required at \( C \). Or, if you would place pillars at \( F \) and \( I \), observe the same method, ruling the parallels \( FG \) and \( IK \), and the perpendiculars \( GH \) and \( KL \) will give their heights at the distances required.

To find the diameter or thickness of pillars at any particular distances, you are also to be guided by that nearest the base. For instance: Suppose your nearest pillar \( AB \) to be ten feet high, and one foot in diameter: divide it from top to bottom into ten equal parts, and set off one of them upon the base of the pillar: then rule a line from the point of sight \( M \) to the diameter \( P \), and you will have the thickness of all your pillars on their respective parallels or bases.

The same rule exemplified in objects below the horizon. See Plate CXLIV. fig. 4.

If you would know the heights of a number of figures below the horizon, rule your horizontal line \( QR \), and fix your point of sight, as at \( P \); then place your nearest figure, or mark the dots for the head and feet, by the points \( A \) and \( B \), which answer the same purpose; and rule from these dots to the point of sight the lines \( AP \) and \( BP \); and if you would find the height of a figure to be drawn at \( c \), rule from thence the parallel \( cd \) to the diagonal \( BP \), and the perpendicular \( de \) will give the height required. The same directions will give the height of a figure at any other distance you have a mind to place it, as at \( f \), \( i \), and \( m \), by ruling the parallels \( fg \), \( ik \), and \( mn \); and from each of these their respective perpendiculars \( gb \), \( kl \), and \( no \); which perpendiculars will give the heights of the figures at \( f \), \( i \), and \( m \).

4. To draw a direct view. See Plate CXLIV. fig. 4.

To illustrate this example, suppose you were to draw the inside of a church, as represented in this figure: First take your station at the point \( A \), in the centre of the base line.

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hues inferred, is the point of sight F. This perpendicular is divided by the perpendicular EA; and where these two lines intersect, is the point of sight F. This perpendicular will pass through the centres of all the arches in the dome or cupola; which centres may be found by any three given points. Next divide your base line into any given number of feet; and the visual lines, ruled from these divisions to the point of sight, will reduce all your objects to their just proportion, by setting off their height upon a perpendicular raised at their respective distances. The base, in the example here given, is divided into twelve equal parts of five feet each; from which (supposing your front column to be 35 feet high) take seven divisions from the base line of your drawing, and set them off upon the perpendicular GH; to be, 35 feet high) take seven divisions upon the parallel IK, which is the breadth required. So that, by proportioning this scale you may set off one of those divisions upon the parallel IK, which is (supposing this column to be five feet thick at the base) your horizon at any height you think proper, as at DE: then from this point of sight the lines FIF and KF; after which, rule the diagonals from D to C, and from E to E, and the perpendicular FG, raised through the point of their intersection, will shew the true centre of the roof, as will appear by ruling the lines GE and GC.

To find the centre for the roof of a house, in an oblique view.

See fig. 8. of Plate CXLIV.

Suppose from the point of sight A, the visual lines AB and AC be drawn, BC being one perpendicular given, and DE the other, rule the diagonals from D to C, and from E to E, and the perpendicular FG, raised through the point of their intersection, will shew the true centre of the roof, as will appear by ruling the lines GE and GC.

For want of being acquainted with this necessary rule, many who have been well versed in other parts of perspective, have spoiled the look of their picture, by drawing the roofs of their houses out of their true perpendicular.

We shall conclude by giving a few practical rules. 1. Let every line, which in the object, or geometrical figure, is straight, perpendicular, or parallel to its base, be so also in its iconographic delineation. 2. Let the lines, which in the object return at right angles from the fore-right side, be drawn iconographically from the visual point. 3. Let all straight lines, which in the object return from the fore-right side, run in an iconographic figure into the horizontal line. 4. Let the object you intend to delineate, standing on your right-hand, be placed also on the right hand of the visual point; and that on the left-hand, on the left-hand of the same point; and that which is just before, in the middle of it. 5. Let those lines which are (in the object) equidistant to the returning line be drawn in the iconographic figure, from that point found in the horizon. 6. In setting off the altitude of columns, piers, and the like, measure the height from the base line upwards, in the front or forearm side; and a visual ray down that point in the front shall limit the altitude of the column or pillar, all the way behind the fore-right side, or orthographic appearance, even to the visual point. This rule you must observe in all figures, as well where there is a front or forearm side, as where there is none. 7. In delineating ovals, circles, arches, croffes, spirals, and crofs arches, or any other figure in the roof of any room, first draw iconographically, and so with perpendiculars from the most eminent points thereof, carry it up unto the ceiling; from which several points, carry on the figure. 8. The centre in any iconographic regular figure is found by drawing lines from opposite angles: for the point where the diagonals cross, is the centre. 9. A ground-plane of squares is alike, both above and below the horizontal line; only the more it is distant above or beneath the horizon, the squares will be so much the larger or wider. 10. In drawing a perspective figure, where many lines come together, you may, for the directing of your eye, draw the diagonals in red; the visual lines in black; the perpendiculars in green, or other different colours, from that which you intend the figure shall be of. 11. Having considered the height, distance, and position of the figure, and drawn it accordingly, with side or angle against the base; raise perpendiculars from the several angles,
or projected points, from the figure to the base, and transfer
the length of each perpendicular, from the place where it
touches the base, to the base on the side opposite to the point
distance; so will the diameters drawn to the perpendiculars
in the base, by intersection with the diagonals, drawn
to the several transferred distances, give the angles of the
figures, and fo lines drawn from point to point will circumference
the inclosed figure. If in a landscape there
be any standing-waters, as rivers, ponds, and the like,
place the horizontal line level with the farthest height or appear ance of it. 13. If there be any house, or the like, in
the picture, consider their position, that you may find from
what point in the horizontal lines to draw the front and
sides thereof. 14. In describing things at a great distance,
observe the proportion, both in magnitude and distance, in
draught, which appears from the object to the eye. 15. In colouring and shadowing of every thing, you must do
the same in your picture, which you observe with your eye,
especially in objects lying near; but, according as the di-
distance grows greater and greater, so the colours must be
especially in objects lying near; but, according as the di-
grees, which also by the refracted beams is made and continued
on the other side of the same flat. 19. When these
faces on a crystal are returned towards a plane placed di-
rectly before it, they separate themselves at a good dis-
tance on the plane; because they are all directed to various far-
distant places of the same. See Optics.

The matter of sweat is separated from the blood by
the miliary glands, and is therefore much more gross than that of insensible perspiration; for as there are no
glands which serve for the excretion of this last fluid, it
is supposed to proceed from the extremities of the capill
ary arteries.

The use of perspiration is to preserve the suppleness of
the papilte of the skin; to carry the saline particles off
from the blood, and by this means to render it more pure;
to preserve the body from various diseases; and to contrib
ute to the cure of the most dangerous distempers. It
may be promoted by exercise, by dry frictions with a
coarse linen-cloth or a flint-brush, by warm baths, and
wathing the hands, feet, head, &c.

PERTH, the capital of the county of the same name in
Scotland, thirty miles north of Edinburgh.
PERTHAMBOY, a port-town of New-Jersey, in North
America: W. long. 74°. N. lat. 40° 45'.
PERTINENT OF LANDS, in Scots law. See Law, Tit.

PERU, formerly a powerful empire in South America, but
now a province of Spain, is situated between 60° and 81°
of west longitude, and between the equator and 25° of
south latitude, being near 2000 miles in length from
north to south, and from 200 to 500 broad: it is bounded
by Popayan, on the north; by the mountains of An-
des, on the eait; by Chili and La Plata, on the fouth;
and by the Pacific Ocean, on the weft.

PERUGIA, a city of Italy, in the territories of the pope :
E. long. 15° 16', N. lat. 43°.
PERUVIAN BARK. See CINCHONA.
PESARO, a city of Italy, in the province of Urbino, situ-
ated on the sulph of Venice: E. long. 14°, N. lat. 44°.
PESSARY, in medicine, a solid substance composed of
wool, lint, or linen, mixed with powder, oils, wax, &c.

PERUVIAN BARK. See CINCHONA.
PET, a city of upper Hungary, situated on the Danube:
E. long. 16° 15', N. lat. 47° 42'.

PESTILENCE, in medicine. See Medicine, p. 71.

PESTALOZZI, among botanists. See Botany, p. 657.

PETER, in the art of war. See Gunnery, p. 761.

PETACITES, in botany. See Tussilago.

PETECHIA, in medicine, denotes spots in the skin like fleabites, which come out in malignant fevers, hence called petechial or spotted fevers. See Medicine, p. 67.

PETER, or Epistles of St. Peter, two canonical books of the New Testament, written by the apostle St. Peter, and addressed to the Jewish converts who were scattered throughout Pontus, Galatia, &c. not only upon the perfection raised at Jerusalem, but upon former differences of the Jews into those places. The first of these epistles is principally designed to comfort and confirm them, under those fiery trials they were then subjected to; and to direct them how to behave in the several states and relations, both of the civil and the Christian life. In the second epistle, the apostle prosecutes the same subject, to prevent their apostasy from the faith, and guard them against the corrupt principles of the gnostics, and those who fecked at the promises of Christ's coming.

St. Peter's Day, a festival of the Christian church, observed on the twenty-eighth of June.

PETERBOROUGH, a city of Northamptonshire, situated on the river Nene, thirty-four miles north-east of Northampton; W. long. 15', N. lat. 52° 53'. It sends two members to parliament.

Peter-Pence, an ancient tax of a penny on each house, paid to the pope.

It was called peter-pence because collected on the day of St. Peter ad vindex, and sent to Rome; whence it was also called Rome-scot and Rome-penny.

PETERSBURG, the capital city of Russia, and one of the largest and most populous cities in the world, situated on both sides the river Neva, in the provinces of Carelia and Ingria, between the gulph of Finland and the lake of Ladoga; E. long. 31°, N. lat. 60°. There were no less than sixty-five thousand houses built within three or four years after the foundation was laid, which was in the year 1703.

PETERSFIELD, a borough-town of Hampshire, fifteen miles south-east of Winchester.

PETERSHAGEN, a town of Germany, in the circle of Westphalia, and duchy of Minden, thirty-seven miles west of Hanover; subject to Prussia.

PETHERTON, a market-town of Somersetshire, 16 miles south-west of Wells.

PETIOLE, in botany, the slender stalks that supports the leaves of a plant.

PETITJAVES, a port-town of Hispantia, situated on a bay at the west end of the island: W. long. 76°, N. lat. 18° 5': subject to France.

PETITIO PRINCIPIS, in logic, the taking a thing for true, and drawing conclusions from it as such; when it is really false, or at least wants to be proved, before any inferences can be deduced from it.

PETITORY ACTION, in Scots law. See Law, Tit. xxx. 15.

PETITIVERIA, in botany, a genus of the hexandria tricytosperms. The calyx consists of four segments; it has no corollas; but one seed with reflexed prickles at the point. There are two species, none of them natives of Britain.

PETRE, or SALT PETRE. See Chemistry, p. 73, 119.

PETREA, in botany, a genus of the didynamia angiospermous plants. The calyx is large, open, coloured, and divided into five segments; the corolla is open and rotated. There is but one species, a native of America.

PETRIDIA, in natural history, a genus of scrupul of a plane, uniform structure, of no great variety of colours, and emulating the external form of pebbles.

PETRIFICATION, in physiology, denotes the conversion of wood, bones, and other substances into stone.

The fossil bodies found petrified are principally either of vegetable or animal origin, and are more or less altered from their original state, according to the different substances they have lain buried among in the earth; some of them having suffered very little change, and others being so highly impregnated with crystalline, sparry, ptyitical, or other extraneous matter, as to appear more malleable of stone or lumps of the matter of the common pyrites; but they are generally of the external dimensions, and retain more or less of the internal figure of the bodies into the pores of which this matter has made its way.

The animal substances thus found petrified are shellfish; the teeth, bony palates, and bones of fish; the bones of land animals, &c. These are found variously altered, by the infinuation of fluid and mineral matter into their pores; and the substance of some of them is now wholly gone, there being only stone, sparry, or other mineral matter remaining in the shape and form.

PETROBRUSIANS, in church-history, a religious sect which arose in France and the Netherlands, about the year 1126, so called from their leader Peter Bruys. They denied that children, before the use of reason, can be justified by baptism. They also condemned all places of public worship, crosses, crucifixes; and are said to have rejected the sacrament of the eucharist, and prayers for the dead.

PETROLEUM, also called rock-oil, is an extremely subtle and penetrating fluid, and is much the thinnest of all the native bitumens. It is very light and very pellucid; but though equally bright and clear under all circumstances, it is liable to a very great variety in its colour. It is naturally almost colourless; and in its appearance greatly resembles the most pure oil of turpentine: this is called white petroleum, though it has no more colour than water; it is sometimes tinged of a brownish reddish, yellowish, or faint greenish tinge; but its most frequent colour is a mixture of the reddish and blackish, of such a degree that it looks black when viewed behind the light, but purple when placed between the eye and a candle or window. It is of a pungent and acrid taste, and of a very strong and penetrating smell, which very much approaches to that of the distilled oil of amber. The white
PHALEUCIAN VERSÉ, in ancient poetry, a kind of verse which consists of five feet, the first of which is a spondee, the second a dactyl, and the three last trochees.

PHANTASM, a term sometimes used in a synonymous sense with idea, or the notion retained in the mind of an object.

PHARISEES, a famous sect of the Jews, who distinguished themselves by their zeal for the traditions of the elders, which they derived from the same fountain with the written word itself; pretending that both were delivered to Moses from Mount Sinai, and were therefore both of equal authority. From their rigorous observance of these traditions, they looked upon themselves as more holy than other men, and therefore separated themselves from those whom they thought sinners or prophanes, so as not to eat or drink with them; and hence, from the Hebrew word pharis, which signifies to separate, they had the name of Pharisees or Separatists.

PHAROS, a small island in the Mediterranean sea, opposite to Alexandria, in Egypt.

PHAROS, or Pharos, a light-house, a pile raised near a port, where fire is kept burning in the night, to guide vessels near at hand.

PHASALUS, a town of ancient Thebais, situated in European Turkey, a little south of Larissa, in E. lon. 23°, and N. lat. 39°.
PHE (476) PHI

PHARYNX, in anatomy. See Anatomy, p. 302.

PHASCUM, in botany, a genus of the cryptogamia musci glads. The antheca are oculated, and the calyptra is wanting. There are four species, all natives of Britain.

PHASEOLOUS, in botany, a genus of the diadophia decandria class. The carina, flamina, and stylus, are twilled like a cirew. There are 13 species, none of them natives of Britain.

PHASES, in astronomy, the several appearances or quantities of illumination of the moon, venus, mercury, and the other planets. See Astronomy.

PHASIANUS, in ornithology, a genus belonging to the order of gallinae. The cheeks are covered with a smooth naked skin. There are six species, viz. 1. The sullus, or dunghill cock and hen, with a compressed caruncle or flitty-comb on the top of the head, and a couple of caruncles or wattles under the chin; the ears are naked; and the tail is compressed, and erected. This bird, though not one of the domestic fowls, was originally brought from the East-Indies. They feed upon grain, grass, seeds, and worms. The cock or male is perhaps the boldest and most heroic of all the feathered tribe. He claps his wings before he sings or crows. He begins to crow about midnight, and seldom ceases till break of day. He is so exceedingly Lucious, that one cock is sufficient for 10 hens. His flight is very piercing, and he never fails to cry in a peculiar manner when he discovers any bird of prey in the air. The hen is very proflic: she makes her nest on the ground; and the young, immediately after they are hatched, follow her, and pick up their food themselves. There are six or eight varieties of this species. 2. The motmot, or Guinea pheasant, is brownish, somewhat red below, with a wedge-like tail, and wants fperms. It is a native of Guiana and Brazil.

3. The colicius, is red, with a blue head, a wedge-shaped tail, and papillosus cheeks. It is a native of Asia.

4. The argus is yellowish, with black spots, a red face, and a blue crest on the back part of the head. It is found in Chincan Tartary.

5. The pittus, has a yellow crest, a red breast, and a wedge-shaped tail. It is a native of China. 6. The nycthemerus, is white, with a black comb and belly, and a wedge-shaped tail. It is a native of China. See Plate CXXII.

PHASMATA, in physiology, certain appearances arising from the various tinctures of the clouds, by the rays of the heavenly luminaries, especially the sun and moon. These are infinitely diversified by the different figures and situation of the clouds, and the appulses of the rays of light.

PHASSACHATES, in natural history, the name of a species of agate, which the ancients, in its different appearances, sometimes called also leucachates and penleucos. See Agate.

PHEASANT, in ornithology. See Phasianus.

PHELLANDRIUM, in botany, a genus of the pentan-dria digynia class. The fruit is oval and smooth. There are two species, one of them, viz. the aquaticum, or water hemlock, is a native of Britain.

PHELYPÆA, in botany. See Lathrea.

PHENICIA, a subdivision or province of Syria, situated on the Levant, or eastern part of the Mediterranean sea, on the confines of Palestine.

PHIONS, in heraldry, the barbed heads of darts, arrows, or other weapons, and usually represented as in Plate CXLI. fig. 1.

PHIDITIA, in Greek antiquity, feasts celebrated with great frugality at Lacedaemon. The phiditia were held in the public places, and in the open air: rich and poor attended them alike, and on the same footing; their design being to keep up peace, friendship, and a good understanding and equality among all the citizens, great and small. It is said, that they who attended this feast, brought each a bushel of flour, eight measures of wine named choras, five mine of cheese, and as much figs.

PHILADELPHIA, the capital of the province of Pennsylvania, in North America, situated on the rivers Delawar and Schuylkill: W long. 74°, N. lat. 40° 50'.

PHILADELPHIA is also the name of an ancient town of the Lefser Alfa, situated in E. long. 29°, N. lat. 38°.

PHILADELPHUS, in botany, a genus of the iofandria monogynia class. The calix consists of four or five segments, and the corolla of four or five petals; and the capsule has four or five cells, containing many seeds. There are two species, none of them natives of Britain.

PHILLIP-FORT, a fortress in Dutch Brabant, situated on the east side of the Scheldt, opposite to Pearl-fort, five miles north-west of Antwerp.

PHILIPPI, an ancient town of Macedonia, a province of European Turkey, situated in E. long. 25°, N. lat. 41°.

PHILIPPI, in literature, a name given to the orations of Demothenes against Philip king of Macedon; being esteemed the master pieces of that great orator.

Philippic is also a term applied to the fourteen orations of Cicero against Mark Anthony.

PHILIPPINE ISLANDS, situated in the Pacific ocean, in Asia, between 114° and 131° east longitude, and between 5° and 10° north latitude: there are a great number of them, and some very large.

PHILIPPINES, a religious society of young women, at Rome, so called from their taking St. Philip de Neri for their protector: they consist of an hundred poor girls, who are brought up till they are of age to be married, or become nuns, under the direction of some religious women, who teach them to read, write, and work; and instruct them in the duties of Chriftianity. They wear a white veil, and a black cross on their breasts.

PHILIPPOPOLE, a city of European Turkey, in the province of Perramian, situated on the river Mariza: in E. long. 8° 16', N. lat. 49° 8'.

PHILIPSBURGH, a city of Germany, in the palatinate of Gothland and territory of Wermeland, situated in E. long. 14°, N. lat. 59° 50'.

PHILLYREA, in botany, a genus of the diadria monogynia class. The corolla consists of four segments, and the berry contains four seeds. There are three species, none of them natives of Britain.

PHILOLOGY, a science, or rather assemblage of several sciences, confounding of grammar, rhetoric, poetry, antiquities, history, and criticism.

Phylogeny is a kind of universal literature, conversant about all the sciences, their rise, progress, authors, &c.

It makes what the French call the belles lettres.

PHILOMATHES, a lover of learning or science.

PHILONIUM,
PHILTRON, in pharmacy, a kind of sonorous ana-
dyce opiate, taking its name from Philo the inventor.

PHILOSOPHER, a person versed in philosophy; or one
who makes profession of, or applies himself to, the study
of nature and morality.

PHILOSOPHER'S STONE, the greatest object of alchymy,
is a long sought for preparation, which, when found, is
to convert all the true monearial part of metal into pure
gold, better than any that is dug out of the mines, or
perfected by the refiner's art; and this only by calling a
little quantity thereof upon metals in fusion, whiff that
part of the metal which was not mercury is immediately
burnt or blown away. But this like every other scien-
tific chimera, will for ever elude the researches of man-
kind.

PHILOSOBO, or PHILOSOBOICAL, something that
relates to philosophy. See Philosophy.

PHILOSOPHALICAL EGG, among chemills, a thin glafs-
body, or bubble, of the shape of an egg, with a long
neck or stem, used in digestions.

PHILOSOPHY, the knowledge or study of nature and mo-
rality, founded on reason and experience. See Mecha-
nics, Optics, Astronomy, Logic, Morals, &c.

PHILYCTENIUS, in medicine, small eruptions on the skin.

PHILYCTENIUS, in medicine, a genus of the pentandria monogy-

PHILOPHAGUS, in pharmacy, such medicines as

PHLISMAGOGUES, in pharmacy, such medicines as

PHLEGHISCIERIA, another clafs of foffils, which are

PHLEGMON, denotes an external inflammation and

PHLEGMATIC, among phyficians, an appellation given
to that temperament or habit of the body, wherein phlegm
is predominant; which gives rise to catarrhs, coughs,
and daughters, in their train. They copulate on the shore,
the female lying on their backs. They are hardly afraid
of men, and bite stones when thrown at them. Each has
a particular stone for his bed, which they seldom defert.
They often fight for their wives and beds; when one is
beaten, another makes a fresh attack, and thus succeed
alternately, two never attacking one, till the whole be
gathered, when they make a hideous wailing noise. They
are found in the northern seas. 2. The leonina, or sea-
lion, has a crest on his forehead. They are found near
the south pole. They swim in troops, and fight for their
wives. 3. The vitulina, or sea-calf, has a smooth head,
the nostrils are linear; and the feet are palmated, and
four-toed. There is but one species, native of Africa
and America.

PHOENICEA, a city of Odisis, on the west coast of the leffer
Asi, anciently so called.

PHOENICOPTERUS, or Flamingo, in ornithology,
a genus of birds belonging to the order of grallae. The
beak is naked, toothed, and bent as if it were broken;
the nostrils are linear; and the feet are palmated, and
four-toed. There is but one species, a native of Africa
and America.

PHOENIX, in astronomy. See Astronomy, p. 487.

PHOENIX, the great palm, or date-tree, in botany,
a genus of plants, the characters of which are not yet
perfectly ascertained: the male and female flowers are
on distinct plants, or on the same spadix.

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PHOLAS, a genus of insects belonging to the order of
vernus tettaceae. The shell is double-valved and divari-
cated; the cardo is turned backwards, and connected by
a carillage. There are six species, distinguished by the
figure of their shells.

PHONICS, the doctrine or science of sounds, otherwise
called acoustics. See Pneumatica.

PHOSPHORUS, See Chemistry, p. 123.

PHRENES,
PHRENSY, in medicine, an inflammation of the membranes of the brain, attended with an acute fever and delirium. See Medicine, p. 88.

PHRYGIA, the Greater and Lesser, two provinces anciently of Asia Minor; having the Hellefront on the north.

PHTRHRIASE, in medicine, the pedicalaris morbus, or lousy disease, is most incident to children, though adults are not wholly exempt from it.

PHTHISIS, a species of consumption, arising from an ulcer of the lungs. See Medicine, p. 103.

PHYLLANTHUS, in botany, a genus of the monocotyledons. The calyx both of the male and female consists of eight segments; neither of them have any corolla; the female has three birti flowers; the capsule has three cells, and contains one seed. There are fix species, none of them natives of Britain.

PHYLLIS, in botany, a genus of the pentandria digynia class. The corolla is rotated; the seeds are connivent; and the berry has two cells, and is contained within an inflated calyx. There are ten species, none of them natives of Britain.

PHYSETER, in zoology, a genus belonging to the order of Cete. It has teeth in the under jaw, and a fillet in the head or snout. There are four species, viz. 1. The catodon, with a fillet in the snout, and having no back-fin. 2. The macrocephalus has a fillet in the neck, and no back-fin. The spermaceti is extracted from this species. 3. The microps, with a long fin on the back, and the upper jaw much longer than the under one. 4. The turbo, with a very high fin on the back; and the points of the teeth blunt. All the four species are inhabitants of the northern Ocean.

PHYSIC. See Medicine.

PHYSICAL, something relating to nature.

PHYSICIAN, a person who professes medicine, or the art of healing diseases.

PHYSICS, a denomination sometimes given to natural philosophy.

PHYSIOLOGY, properly denotes a discourse of nature, and natural bodies; or, it is that part of natural philosophy which treats of the various phenomena of nature in a scientific and speculative way.

Among physicians, the term physiology denotes the history of the human body and its several constituent parts, with their relations and functions.

PHYTOBMA, in botany, a genus of the pentandria monogyina class. The corolla is rotated, with linear laciniae; the stigmas are trifid; and the capsule has two or three cells. The species are fix, only one of them, viz. the orbiculata, or orbicularis, or horned ramboult, a native of Britain.

PHYTOLEACCA, in botany, a genus of the decandria deceragynia class. It has no calix; the petals are five; and the berry has ten cells, and ten seeds. There are four species, none of them natives of Britain.

PHYSIOLOGY, a discourse concerning the kinds and virtues of plants.


PICA, in ornithology. See Corvus.

PICA, in medicine, a depravation of appetite, which makes the patient long for what is unfit for food, or incapable of nourishing, as chalk, ashes, coals, plaster, lime, &c.

PICT, the name of a class of birds. See Natural History.

PICARDY, a province of France, bounded by the French Netherlands, and the Straits of Dover, on the north and east; by the Isle of France, on the south; and by Normandy, and the English channel, on the west.

PICKLE, a brine or liquor, commonly composed of salt, vinegar, &c., sometimes with the addition of spices; wherein meat, fruit, and other things are preserved and seasoned.

PICKERY, in Scotch law, petty theft, or stealing things of small value.

PICQUERING, a flying war or skirmish made by soldiers detached from two armies for pillage, or before a main battle begins.

PICRIS, in botany, a genus of the syngeneia polygamia class. The receptacle is naked; the calyx is calciculated; the pappus is feathery; and the seeds are rowed transversely. There are four species, two of them natives of Britain, viz. the echio, or ox's tongue, and the hieracoides, or yellow succory.

Picts wall, in antiquity, a wall begun by the emperor Adrian, on the northern bounds of England, to prevent the incursions of the Picts and Scots. It was first made only of turf, strengthened with palisadoes, till the emperor Severus coming in person into Britain built it with solid stone. This wall, part of which still remains, began at the entrance of Solway-frith in Cumberland, and running N. E. extended to the German ocean.

PICTURE, a piece of painting, or a subject represented in colours, on wood, canvas, paper, or the like.

PICUS, the Wood-pecker, in ornithology, a genus belonging to the order of picas. The beak is straight, and consists of many sides, and like a wedge at the point; the nostrils are covered with bristly feathers; the tongue is round like a worm, very long, sharp at the point, which is befe with bristles bent backwards. There are 21 species, distinguished by their colour.

PIECE, in heraldry, denotes an ordinary or charge. See Charge.

PIEDMONT, a principality of Italy, so called from its lying at the foot of the Alps. It is bounded by Savoy, from which it is separated by the Alps, on the north; by the duchies of Milan and Montferrat, on the east; by the territories of Genoa, and the county of Nice, on the south; and by France, on the west, being about 100 miles long, and 70 broad.

PIER, in building, denotes a mass of stone, &c. opposed by way of fortresses against the force of the sea, or a great river, for the security of ships that lie at harbour in any haven.

PIETISTS, a religious sect sprung up among the protestants of Germany, seemingly to be a kind of mean between the quakers of England, and the quietists of the Romish church.

PIG, in zoology. See Sus.

Guinea-Pig. See Mus.

Pig of head, the eighth part of a fother, amounting to two hundred and fifty pounds weight.

PIGEON, in ornithology. See Columba.

PIGMENTS, preparations used by painters, dyers, &c. to impart
PILOT, a person employed to condue ships over bars and
PIMENTO, in botany. See Myrtus, of which it is a
PIMPINELLA, in botany, a plant of the pentandria di-
PILLAR, in architecture. See Architecture, p. 333.
PILCHARD, in ichthyology. See Clupea.
PILE, in heraldry, an ordinary in form of a wedge, con-
PILL, in pharmacy, a form of medicine resembling a lit-
PILGRIMAGE, a kind of religious discipline, which con-
Piles, in medicine. See Medicine, p. 1. These deca-
PILGRIMAGE, a kind of religious discipline, which con-
PISTACHIO, in botany. See Spinacia.
PINE, in botany. See Pinus.
PINDARIC, in poetry, an ode formed in imitation of the
PINE, in botany. See Pinus.
PINEAPPLE. See Bromelia.
PINGUICULA, in botany, a genus of the diandria mon-
PINE, in botany. See Pinus.
PINCER, in mechanics, an arbor, or spindle, in the body
PIGNOL, in architecture, a kind of irregular column,
PILLAR, in architecture, the top or roof of a house,
PILLORY, was anciently a post erected in a cross road,
PILLOW, in pharmacy, a form of medicine resembling a
PILOT, a person employed to conduct ships over bars and
PIMENTO, in botany. See Myrtus, of which it is a
PIGUS, in ichthyology. See Cyprinus.
PIKE, in ichthyology. See Lucius.
PINK, a vessel used at sea, with a square stern,
PINK, in botany. See Dianthus.
PINIONS, in botany. See Diandria tri-
PINE, in botany. See Pinus.
PIN, in commerce, a little necessary implement made of
PINUS, in botany, a genus of the monoecia monadelphia
PIGIONS, in botany, the greatest numbers now refert to Loretto, in order to
PINDARIC, in poetry, an ode formed in imitation of the
PINEAPPLE. See Bromelia.
PINGUICULA, in botany, a genus of the diandria mon-
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PIMENTO, in botany. See Myrtus, of which it is a
PIGUS, in ichthyology. See Cyprinus.
PIKE, in ichthyology. See Lucius.
PINK, a vessel used at sea, with a square stern,
PIRACY, in Scots law. See LAV/, Tit. xxxiii.

PIRATE, a person, or vessel, that robs on the high seas, without permission or authority of any prince or state.

PISA, a city of Italy, in the duchy of Tuscany, situated on the river Arno, four miles east of the sea, and ten miles north of Leghorn.

PISCARY, in our ancient statutes, the liberty of fishing in another man's waters.

PISCIAS, in astronomy, the twelfth sign or constellation of the zodiac. See ASTRONOMY, p. 487.

PISCINA, in antiquity, a large basin in a public place or square, where the Roman youth learned to swim, and which was surrounded with a high wall, to prevent calling of filth into it.

PISSAPHALTUM, earth pitch, a fluid, opaque, mineral body, of a thick consistence, of a strong smell, readily inflammable, but leaving a residuum of grayish ashes after burning. It arises out of the cracks of rocks, in several places in the island of Sumatra, and in some other parts of the East-Indies, and is much esteemed there, in paralytic disorders.

PISSALDEUM Indicum, Barbadoes tar, a mineral fluid, of the nature of the thicker bitumens, and of all others the most approaching in appearance, colour, and consistence, to the true pitchphaltum, though differing from it in other respects. It is very frequent in many parts of America, where it is found trickling down the sides of mountains in large quantities, and sometimes floating on the surface of the waters. It has been greatly recommended internally in coughs and other disorders of the breath and lungs.

PISTACIA, in botany, a genus of the dioecia pentandria class. The calyx of the amentum in the male consists of five segments; it has no corolla: The calix of the female consists of three segments; it has no corolla: there are three stili; and the drupa contains one seed. There are five species, all natives of warm climates.

Pistachia-nuts abound with a sweet and well-tasted oil, which they will yield in great abundance, on being pressed: they are reckoned wholesome and nutritious, and are very proper to be prescribed by way of restoratives, eaten in a moderate quantity, and to people emaciated with long sickness.

PISTIL, among botanists. See Botany, p. 637.

PISTOL, the smallest piece of fire-arms, born at the saddle bow, on the girdle, and in the pocket.

PISTOLE, a gold-coin, struck in Spain, and in several parts of Italy, Switzerland, &c.

The pistol has its augmentations and diminutions, which are quadruple pistols, double pistols, and half pistols.

PISTON, in pump-work, is a short cylinder of metal, or other solid substance, fitted exactly to the cavity of the barrel or body of the pump. See HYDROSTATICS.

PISUM, in botany, a genus of the diadelphia decandria class. The stylos is triangular, carinated and downy above; and the two upper laminæ of the calix are shorter than the rest. The species are four, only one of them, viz. the mariponum, or pea-pea, a native of Britain.

Pees are nutritious, and accordingly used for food; but rarely for any medicinal purposes, except to keep issues open; for which purpose they are rubbed with ballston, or linimentum Aretii.

PITCH, a tenaceous oily substance, drawn chiefly from pines and firs, and used in shipping, medicine, and various other arts: or it is more properly tar, inspired by boiling it over a slow fire.

The method of procuring the tar, is by clearing the trees into small billets, which are laid in a furnace that has two apertures, through one of which the fire is put, and through the other the pitch is gathered, which, oozing from the wood, runs along the bottom of the furnace into places made to receive it. When the smoke, which is here very thick, gives it blackness, this is called pitch; which, on being boiled, to consume more of its moisture, becomes pitch.

There is another method of drawing pitch, used in the Levants: a pit is dug in the ground, two ells in diameter at the top, but constricting as it grows deeper; this is filled with branches of pine, cloven into shivers; the wood at the top of the pit is then set on fire, and burning downwards, the tar runs from it out of a hole made in the bottom; and this is boiled, as above, to give it the confidence of pitch.

PITH, in vegetation, the soft spongy substance contained in the central parts of plants and trees. See AGRICULTURE, Part I.

PITUITARY GLAND, in anatomy. See Anatomy, p. 286.

PLACE, in war, a general name for all kinds of fortrsetes where a party may defend themselves.

Common Place. See Common Place.

PLACENTA, in anatomy and midwifery, a soft roundish mass found in the womb of pregnant women; which, from its resemblance to the liver, was called by the ancients hepar uterinum, the uterine liver. See Midwifery, p. 208.

PLACENTIA, a city of Spain, in the province of Estremadura; W long. 6º, N. lat. 39º 45'.

PLAGIARY, in philology, the purloining another person's works, and putting them off for a man's own. Among the Romans, plagius was properly a person who bought, sold or retained a freeman for a slave; and was so called, because by the Flavian law such persons were condemned, ad plagas, to be whipped.

PLAGIURI, among ichthyologists, a class of fishes comprehending all those which have the tails not perpendicular, but placed in an horizontal direction.

PLAGUE, Pestilence, or Pestilential fever. See Medicine, p. 71.

PLAISE, the English name of a species of the pleuronectes. See Pleuronectes.

PLAN, in general, denotes the representation of something drawn on a plane: such are maps, charts, ichnographies, &c.

The term plan, however, is particularly used for a draught of a building, such as it appears, or is intended to appear, on the ground; shewing the extent, division, and distribution of its area, or ground-plot, into apartments, rooms, passages, &c.

PLANE, in geometry, denotes a plain surface, or one that lies evenly between its bounding lines: and as a right line is the shortest extension from one point to another, so a plain
plain surface is the flattest extension from one line to another.

PLANE, in joinery, an edged tool, or instrument for parting and having of wood smooth.

It consists of a piece of wood, very smooth at bottom, as a flock or shift; in the middle of which is an aperture, through which a steel edge, or chisel, placed obliquely, passes; which being very sharp, takes off the inequalities of the wood it is split along.

PLANE-TREE, in botany. See PLATANUS.

PLANT, is defined to be an organical body, definite of an external action, and continually changing. In such a manner as to draw from it its nourishment, and having power of propagating itself by seeds. See Agriculture and Botany.

PLANTAGNATUM, a genus of the tetrandria monogynia class. The calyx and corolla has each four segments; the flamina are very long; and the capsule is bilocular. There are 21 species, eight of them natives of Britain.

The root, leaves, and seeds of plaintain, are reckoned cooling and astringent. It is likewise accounted a great healer of fresh wounds.

PLANTAIN. See RAMUNCULUS.


PLANTATION, in the Well-Indies, denotes a spot of ground which a planter or peron arrived in a new colony, pitches on to cultivate for his own use, or is assigned for that purpose. However, the term plantation is often used in a synonymous sense with colony.

PLASTER, in pharmacy, is defined to be an external application of a harder consistence than our ointments; these are to be spread according to the different circumstances of the wound, place, or patient, either upon linen or leather.

PLASTER, among builders, &c. The plaster of Paris is a preparation of several species of gypsums, dug near Mont Maitre, a village in the neighbourhood of Paris; whence the name.

The belf fort is hard, white, shining, and marly; known by the names of plaster-ite, or parget of Mount Maitre. It will neither give fire with steel, nor ferment with aqua fortis; but very freely and readily calcines in the fire, into a very fine plaster; the use of which in building, and making statues, is well known.

PLASTIC, denotes a thing endowed with a formative power, or a faculty of forming or fashioning a mass of matter, after the likeness of a living being; such a virtue as some of the ancients Epicureans, and perhaps the Peripateticians too, imagined to reside in the earth, or at least to have anciently resided therein, by means whereof, and without any extraordinary intervention of a creator, it put forth plants, &c. Some of them seem to be of opinion that animals, and even man himself, was the effect of this plastic power.

PLASTIC ART, a branch of sculpture, being the art of forming figures of men, birds, beasts, fishes, &c. in plaster, clay, flux, or the like.

PLATA, in botany, a genus of the monogynia class. The calyx and corolla is a roundestamentum; the male has no corolla; the corolla of the female consists of many petals; the stigma is bent backward; and the seeds are round.

The species are two, none of them natives of Britain.

PLATIBAND, in gardening, a border or bed of flowers on which cannon is placed, to fire on the enemy; such is made square or not much arched.

PLATIBAND, or spoon-bill, in ornithology, a genus belonging to the order of grallas. The beak is plain, and dilates toward the point into an orbicular form; the feet have three toes, and are half palmated. There are three species, distinguished by their colour.

PLATANUS, the Plane-tree, in botany, a genus of the monogynia class. The calyx both of the male and female is a roundestamentum; the male has no corolla; the corolla of the female consists of many petals; the stigma is bent backward; and the seeds are round.

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PLATIBAND, in gardening, a border or bed of flowers on which cannon is placed, to fire on the enemy; such are the mounts in the middle of curtains.

PLATIBAND, in architecture, is a row of beams, which support the timber-work of a roof, and lie on the top of the wall, where the entablature ought to be raised.

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PLEDGE, in Scots law. See Law, Tit. xx. 13.
PLEDGET, Bolster, or Compress, in surgery, a kind of flat tent, laid over a wound, to imbibe the superfluous humours, and keep it clean.

PLEIADES, in astronomy, an assemblage of stars in the neck of the constellation taurus. See Astronomy, p. 237.

PLENARY, something complete or full.

PLENIPOFENTIARY, a person vested with full power to do any thing. See Embassador.

PLENITUDE, the quality of a thing that is full, or that fills another. In medicine, it chiefly denotes a redundancy of blood and humours.

PLENUM, in physics, denotes, according to the Cartesians, that state of things, wherein every part of space is suppos'd to be full of matter; in opposition to a vacuum.

PLEONASM, a figure in rhetoric, whereby we use words seemingly superfluous, in order to express a thought with the greater energy: such as, I saw it with my own eyes, &c.

PLETHORA, in medicine, a greater redundancy of laudable blood and humours than is capable of undergoing those changes which must necessarily happen for the purposes of life without inducing diseases.

PLEURISY, in medicine. See Medicine, p. 89.

PLEURONECITES, in ichthyology, a genus belonging to the order of thoracici. Both eyes are on the same side of the head; there are from four to seven rays in the gill-membrane; the body is compressed, the one side resembling the back and the other the belly. There are 17 species.

PLEXUS, among anatomists, a bundle of small vessels interwoven in the form of net-work.

PLIMOUTH, or Plymouth, a port-town of Devonshire, and a station for the building and laying up of ships of war belonging to the royal navy: W, long. 4° 27', N. lat. 50° 26'. It sends two members to parliament.

PLIMTON, a borough town of Devonshire, situated near the English Channel, thirty-six miles south-west of Exeter. It sends two members to parliament.

PLINIA, in botany, a genus of the polyandria monogynia class. The corolla consists of five petals, and the calyx of five segments; the berry is furrowed, and contains one seed. There is but one species, a native of America.

PLINTH, in architecture, a flat square member, in the form of a brick.

PLUCKNETIA, in botany, a genus of the monocotyledonous class. It sends two members to parliament.

PLUMBAGO, in botany, a genus of the pentandria monogynia class. The corolla is bell-shaped; the filaments are inserted into scales at the base of the corolla; the stigma is quinquelobate; and there is but one oblong truncate-sessil seed. The species are four, none of them natives of Britain.

PLUMBERY, the art of chasing and working lead, and using it in buildings, &c.

As this metal melts very easily, it is easy to cast it into figures of any kind, by running it into moulds of brass, clay, plaster, &c. But the chief article in plumbery is sheets and pipes of lead; and as these make the basis of the plumber's work, we shall here give the processes of making them. In casting sheet-lead, a table or mould is made use of, which consists of large pieces of wood well jointed, and bound with bars of iron at the ends, on the sides of which runs a frame constituting a ledge, or border of wood, two or three inches thick, and two or three inches high from the mould, called the shaps; the ordinary width of the mould, within these shaps, is from three to four feet; and its length is sixteen, seventeen, or eighteen feet. This should be something longer than the sheets are intended to be, in order that the end where the metal runs off from the mould may be cut off, because it is commonly thin or uneven, or ragged at the end. It must stand very even or level in breadth, and something falling from the end in which the metal is poured into, viz. about an inch, or an inch and a half, in the length of sixteen or seventeen inches. At the upper end of the mould stands the pan, which is a concave triangular prism, composed of two planks nailed together at right angles, and two triangular pieces fitted in between them at the ends. The length of this pan is the whole breadth of the mould in which the sheets are cast: it stands with its bottom, which is a sharp edge, on a form at the end of the mould, leaning with one side against it; and on the opposite side is a handle to lift it up by, to pour out the melted lead; and on that side of the pan next the mould, are two iron hooks to take hold of the mould, and prevent the pan from slipping, while the melted lead is pouring out of it into the mould. This pan is lined at the inside with moistened sand, to prevent it from being fired by the hot metal. The mould is also spread over, about two thirds of an inch thick, with sand sifted and moistened.
en, which is rendered perfectly level by moving over it a piece of wood called a strike, by trampling upon it with the feet, and smoothing it over with a smoothing plane, which is a thick plate of polished brass, about nine inches square, turned up on all the four edges, and with a handle fixed on to the upper or concave side. The land being thus smoothed, it is fit for calling sheets of lead: but if they would call a cistern, they measure out the bigger of the four sides; and having taken the dimensions of the front, or fo far, make mouldings by profiling long strips of wood, which contain the same mouldings, into the level land, and form the figures of birds, beasts, &c. by profiling in the same manner leaden figures upon it, and then taking them off, and at the same time smoothing the surface where any of the land is raised up, by making the impressions upon it. The rest of the operation is the same in calling either cisterns or plain sheets of lead: but before we proceed to mention the manner in which that is performed, it will be necessary to give a more particular description of the strike. The strike then is a piece of board about five inches broad, and something longer than the breadth of the mould on the inside; and at each end is cut a notch, about two inches deep, so that when it is used, it rides upon the sharps with those notches. Before they begin to call, the strike is made ready by backing on two pieces of an old hat on the notches, or by dipping a café of leather over each end. In order to raise the under side about one eighth of an inch, or something more, above the land, according as they would have the sheet to be in thickness; then they hollow the under edge of the strike, and lay it across the mould. The lead being melted, it is ladled into the pan, in which, when there is a sufficient quantity for the present purpose, the form of the metal is swept off with a piece of board to the edge of the pan letting it settle on the land, which is by this means prevented from falling into the mould at the pouring out of the metal. When the lead is cool enough, which is known by its beginning to harden with a shell or wall on the land round the pan, two men take the pan by the handle, or else one of them lifts it up by a bar and chain fixed to a beam in the ceiling, and pours it into the mould, while another man stands ready with the strike, and, as soon as they have done pouring in the metal, puts on the mould, sweeps the lead forward, and draws the overplus into a trough prepared to receive it. The sheets being thus cast, nothing remains but to planish the edges; in order to render them smooth and straight: but if it be a cistern, it is bent into four sides, so that the two ends may join the back, where they are folded together, after which the bottom is folded up.

The method of calling thin sheets of lead. Instead of land, they cover the mould with a piece of wooden stuff nailed down at the two ends to keep it tight, and over this lay a very fine linen cloth. In this process great regard is had to the just degree of heat, so as that the lead may run well, and yet not burn the linen. This they judge of by a piece of paper; for it takes fire in the liquid lead if it is too hot, and if it be not thick and forced a little, it is too hot enough. They have here a strike different from that described above: it is a wooden café, only closed on three sides; it is pretty high behind; but the two sides, like two acute angles, fill dim of the tip from the place where they are joined to the third or middle piece, where they are of the same height therewith, viz. seven or eight inches high, the width of the middle makes that of the strike, which again makes that of the sheet to the cistern. This strike is placed at the top of the mould, which in the part is first covered with a past-board that serves as a bottom to the café, and prevents the linen from beingburst while the lead is pouring in. The strike is now filled with lead, according to the quantity to be used; which done, two men, one at each side, draw the strike down the mould with a velocity greater or less, as the sheet is to be more or less thick.

The method of calling plates without folding. To make these pipes, they have a kind of little mill, with arms or levers to turn it withal. The moulds are of brass, and consist of two pieces, which open and shut by means of hooks and hinges, their inward calibers, or diameter, being according to the size of the pipe to be made, and their length is usually two feet and a half. In the middle is placed a core, or round piece of brass or iron, somewhat longer than the mould, and of the thickness of the inward diameter of the pipe. This core is past through two copper-rundles, one at each end of the mould, which they serve to cloe; and to these is joined a little copper-tube about two inches long, and of the thickness the leaden pipe is intended to be of. By means of these tubes the core is retained in the middle of the cavity of the mould. The core being in the mould, with the rundles at its two ends, and the lead melted in the furnace, they take it up in a ladle and pour it into the mould by a little aperture at one end, made in the form of a funnel. When the mould is full they pass a hook into the end of the core, and turning the mill, draw it out; and then opening the mould, take out the pipe. If they desire to have the pipe lengthened, they put one end of it in the lower end of the mould, and pass the end of the core into it; then shut the mould again, and apply its rundle and tube as before, the pipe just cast serving for rundle, &c. at the other end. Things being thus replaced, they pour in fresh metal, and repeat the operation till they have got a pipe of the length required.

For making pipes of sheet-lead, the plumbers have wooden cylinders of the length and thickness required; and on these they form their pipes by wrapping the sheet around them, and folding up the edges all along them. PLUMBUM, LEAD See CHEMISTRY, p. 84.

PLUMMFT, PLUMB RULE, or PLUMB LINE, an instrument used by carpenters, masons, &c. in order to judge whether walls, &c. be upright planes, horizontal, or the like. It is thus called from a piece of lead, (aliened to the like. It is thus called from a piece of lead, (aliened to the
is let to rest, and the exact point where it rests is marked with a pen; he then goes on farther in the line till he has passed the exact point where the needle stands in this second position. In this manner he proceeds, from turning to turning, marking down the points, and marking the line, till he comes to the intended place; this done, he ascends, and begins to work on the surface of the earth where he did in the adit, bringing the first knot in the line to a place where the mark of the point of the needle will again answer its pointing, and continues this till he come to the desired place above ground, which is certain to be perpendicular to the part of the mine into which the air-shaft is to be sunk.

PLUMOSE, something formed in the manner of a feather.

PLUVIALIS, in zoology. See Charadrius.

PNEUMATICS.

THIS science treats of the nature, weight, and pressure of the air, and the effects arising from it.

The air is that thin transparent fluid body in which we live and breathe. It encompasses the whole earth to a considerable height, and, together with the clouds and vapours that float in it, is called the atmosphere. The air is justly reckoned among the number of fluids, because it has all the properties by which a fluid is distinguished. (See Hydrostatics.) For it yields to the least force impressed, its parts are easily moved among one another, it presses according to its perpendicular height, and its pressure is everywhere equal.

That the air is a fluid, consisting of such particles as have no cohesion between them, but easily glide over one another, and yield to the slightest impression, appears from that ease and freedom with which animals breathe in it, and move through it without any difficulty or sensible resistance.

But it differs from all other fluids in the three following particulars. It can be compressed into a less space than what it naturally possesses, which no other fluid can. 2. It cannot be congealed or fixed, as other fluids may. 3. It is of a different density in every part, upward from the earth's surface, decreasing in its weight as the height increases; and therefore must also decrease in density. 4. It is of an elastic or springy nature, and the force of its spring is equal to its weight.

That air is a body, is evident from its excluding all other bodies out of the space it possesses; for, if a glass jar be plunged with its mouth downward into a vessel of water, there will but very little water get into the jar, because the air of which it is full keeps the water out.

As air is a body, it must needs have gravity or weight; and that it is weighty, is demonstrated by experiment. For, let the air be taken out of a vessel by means of the air-pump; then, having weighed the vessel, let in the air again; and upon weighing it, when re-filled with air, it will be found considerably heavier. Thus, a bottle that holds a wine quart, being emptied of air, and weighed, is found to be about 17 grams lighter than when the air is let into it again; which shows that a quart of air weighs 17 grams. But a quart of water weighs 14625 grains; this divided by 17, quotes 860 in round numbers; which shews, that water is 860 times as heavy as air near the surface of the earth.

As the air rises above the earth's surface, it grows rarer, and consequently lighter, bulk for bulk. Since it is an elastic or springy nature, and its lowermost parts are pressed with the weight of all that is above them, it is plain that the air must be more dense or compact at the earth's surface, than at any height above it; and gradually rare the higher up. For, the density of the air is always as the force that compresseth it; and therefore, the air towards the upper parts of the atmosphere being less pressed than that which is near the earth, it will expand itself, and thereby become thinner than at the surface of the earth.

Dr Cotes has demonstrated, that if altitudes in the air be taken in arithmetical proportion, the rarity of the air will be in geometrical proportion. For instance,

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At the altitude of

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<th>miles above the surface of the earth,</th>
<th>the air is times thinner and lighter than at the earth's surface.</th>
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And hence it is easy to prove by calculation, that a cubic inch of such air as we breathe, would be 10,299 times as heavy as a cubic inch of the air at the altitude of 500 miles, that it would fill a sphere equal in diameter to the orbit of Saturn.
The weight or pressure of the air is exactly determined by the following experiment.

The Toricellian Experiment.

Take a glass tube about three feet long, and open at one end; fill it with quicksilver; and putting your finger upon the open end, turn that end downward, and immerse it into a small vessel of quicksilver, without letting in any air; then take away your finger, and the quicksilver will remain suspended in the tube 29.5 inches above its surface in the vessel; sometimes more, and at other times less, as the weight of the air is varied by winds and other causes. That the quicksilver is kept up in the tube by the pressure of the atmosphere upon that in the basin, is evident; for, if the basin and tube be put under a glass, and the air be then taken out of the glass, all the quicksilver in the tube will fall down into the basin; and if the air be let in again, the quicksilver will rise to the same height as before. Therefore the air's pressure on the surface of the earth, is equal to the weight of 29.5 inches depth of quicksilver all over the earth's surface, at a mean rate.

A square column of quicksilver, 29.5 inches high, and one inch thick, weighs just 15 pounds, which is equal to the pressure of air upon every square inch of the earth's surface; and 144 times as much, or 2160 pounds, upon every square foot; because a square foot contains 144 square inches. At this rate, a middle-sized man, whose surface is about 14 square feet, sustains a pressure of 30,240 pounds, when the air is of a mean gravity; a pressure which supports a greater quantity of mercury in one situation of the tube than in the other. We cannot say, that though in the inclined tube there is a greater quantity of mercury than in the erect one, yet a part of this greater weight will be supported by the side of the tube as by an inclined plane. The true answer is, that the column of air which supports the mercury in the inclined tube, is greater than the column which supports it in the erect one. The height of the column of air is indeed the same in both cases; for in either case it is equal to the height of the atmosphere. But the base of the column of air, and consequently its weight, is greater when the tube is inclined than when it is erect. For the base of the column of air which supports the mercury in the tube, is equal to as much of the flagrant mercury's surface as the base of the tube covers. Now, if the diameters of the tubes D and E are equal; the base of the inclined tube E will cover a greater part of the surface FG than the erect tube D covers, or the base of the tube E will be greater than the base of the tube D. For the contents of the inclined tube are greater than those of the erect one, as has been shown already. But the column of mercury in each of the tubes are cylinders of the same height. Therefore their bases are as their contents. Euc. b. XII. prop. 11.

Since then the contents or the weights of mercury in each tube are as their bases, when their heights are equal; and the base of the column of air, which supports the mercury, and consequently the weight of this column, is proportional to the base of the tube; it follows, that the weight of the air will always be proportional to the weight of the mercury when it stands at a given height, whether the tube is inclined or erect.

The mercury will stand at the same height either in an inclined barometer or in an erect one.

If the mercury at any time stands at the height of 30 inches in the barometer D, (Plate CXLV, fig. 6.) then by inclining this barometer into the position E, the perpendicular height of the mercury will not be altered; for it will still stand at the height of 30 inches; that is, if the level AB is 30 inches from the surface FG, the mercury will stand at this level, either in the erect tube D, or in the inclined one E. Now here it is evident, that if NL is the height of the mercury when the tube is erect, and NM is the height of the mercury in the same tube or an equal one when it is inclined, there must be more mercury in the inclined tube than in the erect one. For we may consider NL as the side, and NM as the diagonal, of a right angled parallelogram. But the diagonal of a right angled parallelogram is longer than the side. Therefore, though either L or M are at the same perpendicular distance from FG, yet NM will be longer than NL. Since then the column of mercury in the inclined tube is longer than in the erect tube, there will be more mercury in the inclined than in the erect one. The question therefore is, How the pressure of the atmosphere can support a greater quantity of matter in one situation of the tube than in the other. We cannot say, that though in the inclined tube there is a greater quantity of mercury than in the erect one, yet a part of this greater weight will be supported by the side of the tube as by an inclined plane. The true answer is, that the column of air which supports the mercury in the inclined tube, is greater than the column which supports it in the erect one. The height of the column of air is indeed the same in both cases; for in either case it is equal to the height of the atmosphere. But the base of the column of air, and consequently its weight, is greater when the tube is inclined than when it is erect. For the base of the column of air which supports the mercury in the tube, is equal to as much of the flagrant mercury's surface as the base of the tube covers. Now, if the diameters of the tubes D and E are equal; the base of the inclined tube E will cover a greater part of the surface FG than the erect tube D covers, or the base of the tube E will be greater than the base of the tube D. For the contents of the inclined tube are greater than those of the erect one, as has been shown already. But the column of mercury in each of the tubes are cylinders of the same height. Therefore their bases are as their contents. Euc. b. XII. prop. 11.

Since then the contents or the weights of mercury in each tube are as their bases, when their heights are equal; and the base of the column of air, which supports the mercury, and consequently the weight of this column, is proportional to the base of the tube; it follows, that the weight of the air will always be proportional to the weight of the mercury when it stands at a given height, whether the tube is inclined or erect.
the bafe of the inlined column we do not mean the bottom
of the inlined tube, but the lowest horizontal section of it.
Thus, if we consider the surface FG as a plane passing
through the two tubes D and E, this plane will cut the tube D
perpendicularly, and the tube E obliquely. But a perpendicu-
lar section of a cylinder is a circle, and an oblique section
of it is an ellipse. Therefore the bafe of the erect column
is circular, and the bafe of the inlined tube is elliptical.

Now, by the supposition, the two tubes have equal diam-
ters, and consequently the shorter axis of the elliptical bafe
will be equal to the diameter of the circular one.

There is another sort of inlined barometer, such as one
as ABR. (ibid. fig. 7.) which is erect for 28 inches from
A to B, and then is inclined from B to C. The mercury
will stand at the same height in this barometer, as if it had
been a flat one AS: for the column of air pressing at the
bafe A would be the same in both cases; and though there
is more mercury in the tube ABR than there would be in
the tube ABS; yet, supposing the mercury to stand at the
same level DC in either case, the pressure of the mercury
downwards will in either case be the same. For, the pre-
 pressure of fluids is as their base and perpendicular height:
and here the bafe A is the same, and the perpendicular height is
the same, whether the tube is erect all the way up as AS,
or is inclined at the top as ABR.

The advantage which is proposed by these diagonal ba-
rometers, as they are called, is to make the variation of
the mercury greater, and consequently more apparent, upon
a given change in the weather. Thus suppositio
AB or 23
inches to be the least height of the mercury, and AD or 31
inches to be the greatest height of it; then the whole varia-
tion will be within the compasses BD, or 3 inches. But if
the barometer, instead of being erect at the top, is incli
into the position BC; then, as the mercury stands at the
same perpendicular height in this diagonal barometer as in
an erect one, AB will be the least height, and ABC will
be the greatest height, since D and C are on the same le-
vel of the same perpendicular distance from A. Now
though BD, one side of the parallelogram, is but 3 inches
long; yet BC may be 30 inches long, or more; and con-
sequently since AB is the least height, and ABC is the grea-
est height, the variation of the mercury will be much greater
than in an erect barometer; in particular, if BC is 30 inches
long, the variation will be 30 inches instead of 3, or will
be 10 times greater in the diagonal barometer than it would
have been in an erect one.

The barometer stands at the same perpendicular height,
whether the tube is large or small.

If the mercury stands at the same height either in the
large tube C or in the small tube D, there must be more
mercury in the large one than in the small one. But since
the heights are equal, the quantities of mercury contained in
these tubes will be as their bases. Now since the columns
of air, by which the mercury is supported in these tubes,
are as the respective bases of the tubes, the columns of air
will be proportional to the weights in each tube, when the
perpendicular heights are equal.

But though the heights of the mercury would be the same
in small tubes as in large ones, if, as we must suppose in
the proposition, the mercury moved equally free in both;
yet in fact, upon any change of weather, the variation will
be greater in a large tube than in a small one: because, in

a large tube, the weight of mercury is so great, that the mo-
tion of it will not be hindered by any attraction or repul-
sion of the glass upon it; whereas, in a small tube, where
the weight of mercury is less, the action of the glass is con-
considered in proportion to that weight, and consequently
the variations will be less upon a given change of the weather.

The barometer will commonly be low in rainy weather.

From what has been said already about the barometer, it
appears, that the mercury will be low when the weight of
the atmosphere is diminished; and such a diminution of
the atmosphere will occasion rain. Therefore, since rain
is occasioned by the same cause that makes the mercury
fall, the barometer will commonly stand low in rainy weather.

The barometer is the lowest of all in violent storms of wind.

When the air moves horizontally with a great velocity,
as it does in violent storms of wind, its weight, or rather its
pressure downwards occasioned by its weight, will be dimin-
ished. For as any heavy body may have such a velocity
given it, when it is thrown down horizontally, as may ei-
ther carry it quite off from the earth's centre, or carry it a
velocity as will make it move round the earth in a circle with-
out either departing from the centre or approaching to it;
so every degree of velocity given to the air will make it
tend or pre tend, according to the situation of the air and the
height of it in the tube will be less in storms than it is at any
other time.

When a storm of wind is over, the mercury will rise very fast.

Because as the horizontal velocity of the air ceases, the
pressure downwards will be suddenly relaxed, and conse-

quently the mercury in the barometer will keep rising as this
pressure is relaxed.

Of the THERMOMETER.

The variations of different thermometers are seldom equal,
upon equal variations of heat or cold.

A THERMOMETER is a well known instrument for esti-
mating different degrees of heat or cold. It consists of a
tube or stem, with a hollow ball at one end of it. The ca-
vity of the ball, and part of the tube, is filled with spirits of
wine, or with liquid oil, or with mercury. The upper
end of the tube is commonly sealed hermetically. But in
fealing this end, the liquor in the thermometer is rareified
by heating it till it almost fills the tube; so that when it
is sealed, and the liquor contracts again as it cools, there
will be a vacuum left in the upper part of the tube. Any
of the fluids will rarely be heat; and will contract again
when they cool; and consequently in warm weather, the
spirits, or the oil, or the mercury, whichever the thermo-
meter is made of, will stand higher than in cold weather.

Thus far thermometers may be said to vary alike; they
will either rise or sink from the same cause. But then, up-
on an equal increase of heat, they seldom vary equally,
though they are made of the same liquor. One thermome-
ter made with spirits of wine may vary upon an equal in-
crease of heat much more than another that is made with
the same sort of spirits; so that if one riles an inch, an-
other may rise but ¼ or ½ inch.

The variation of a thermometer is directly as the capacity
of the ball; and inversely as the base of the item. First, If the base of the item or cylindrical tube is given, the variation, when the spirits are equally warmed, will be directly as the capacity of the ball. For when the spirits are equally warmed, and consequently are equally rarefied in the balls of two different thermometers, whatever proportion tlie bulk of the spirits in one ball bears to the bulk of the spirits in the other ball before they were rarefied, the same proportion those bulk will still bear to each other after they are rarefied. Thus, if one ball is double the other, and consequently the bulk of spirits in one is double the bulk of spirits in the other before they are warmed; then, upon being warmed equally, their densities will diminish equally. But if their densities diminish equally, their bulk will still have the same proportion to each other; or the bulk of spirits in one thermometer will still be double the bulk in the other. But if the bulbs continue in the same proportion to each other, after they are swelled as they were before; the spirits must swell in proportion to their respective bulbs, or the spirits in one must swell twice as much as in the other. But if the spirits swell in this proportion, and by swelling rise into equal tubes in each, they must rise twice as high in the tube of one of these thermometers as they do in the tube of the other. And so, in all other instances, the spirits, upon being equally warmed, will swell in proportion to their bulk, that is, in proportion to the capacity of the ball that contains them. But the heights, to which they rise in equal tubes, will be as the increase of their bulk. Therefore the heights to which they rise, or the variations in equal degrees of heat, will be as the capacity of the ball, when the tubes are equal. We have here supposed that the spirits in the balls of the thermometers are equally heated quite through. In sudden changes of heat and cold, it will be otherwise: for the spirits in a small ball will be sooner heated quite through than in a large one. And consequently, if the heat does not last long enough to warm the spirits in a large ball as much as they are warmed in a small one, the spirits will not be equally rarefied in both, and will not swell in proportion to their respective balls; but those in the small ball will swell more in proportion than those in the large one. Secondly, If the balls are equal, the variations will be inversely as the bases of the items. For if the balls are equal, then, upon being equally heated, the spirits contained in them will swell equally; and consequently equal quantities will rise into the items. Now the spirits which rise into a cylindrical item are a cylindrical column. But the heights of equal cylinders are inversely as their bases. Therefore, when the balls are equal, and equal cylinders of spirits rise into the items, the heights to which they rise, or the variations, will be inversely as the bases of the items.

A universal scale may be made, by which the variations of different thermometers may be compared with one another.

Let the ball of a thermometer be put into water when it is beginning to freeze, or, which is the same as to heat or cold, into snow when it is beginning to melt; and let the place where the fluid in the thermometer stands be marked. The place where the fluid stands in such a trial is the freezing point. Let the ball of the same thermometer be put into water just hot enough to let wax, that swims upon it, begin to coagulate. This again is another determinate degree of heat, and is to be marked upon the thermometer.

Divide the distance between these two points into 110 equal parts; and each of these parts we call a degree. Now a thermometer often sinks lower than the freezing point; because the cold is frequently more intense than what is just sufficient to make water freeze: for this reason, the scale must not begin from the freezing point. This point, therefore, should not be marked 0, nor should the point where melted wax begins to coagulate be marked 110. In this scale, which from the inventor is called Fahrenheit's scale, the freezing point is marked 32; and then the point, where melted wax begins to coagulate, being 110 degrees above it, must be marked 142. When the length of a degree is thus found in one part of the scale, 32 degrees of the same length are set off below the freezing point, and as many such degrees as we please are set off above the point where melted wax begins to coagulate. If the thermometer is made with spirits of wine, only 33 degrees need be set off or marked above 142; and then the scale will begin from 0; 32 degrees will be the freezing point; 142 will be the point where melted wax begins to coagulate; and 142-32 = 110 degrees will be the highest point marked in the scale. The reason why no higher degree need be marked in a scale applied to a thermometer made with spirits, is, that at this degree of heat the spirits will boil, and consequently the thermometer would burst. But if the thermometer is made with mercury, the scale should contain at least 212 degrees from the bottom to the top, or 32 degrees below the freezing point, and 180 above it. The heat of boiling water, at the middle height of the mercury in the barometer, or in the middle weight of the atmosphere, will raise the mercury in the thermometer to 212 degrees, or 180 degrees above the freezing point. A thermometer made with mercury will not burst in such a degree of heat as this; for mercury requires a greater degree to make it boil.

In thermometers with such a scale, or, as they are called, in Fahrenheit's thermometers, the greatest degree of heat in the external parts of the human body is commonly about 96. Boerhave imagined that air, if its heat exceeded 80 or 90 degrees at most, would be destructive to the life of animals: but in this he was mistaken. For in the year 1732 the thermometer in Pennsylvania was at the height of 96 or 97; and in the year 1734 the height of it at Petersburg was 98 degrees. The thermometer in our own climate is scarce ever higher than 78 degrees, and seldom lower than 18; so that we may reckon 48 degrees to be the middle temperature of our air.

The variations of different thermometers, though they are not equal, may be compared with one another by Fahrenheit's scale. For each degree upon different thermometers is proportional to their respective variations, and consequently, though in equal heats one may vary more than another, yet each will vary an equal number of degrees. Thus, if, upon any given increase of heat, one thermometer will vary twice as much as another, then the distance between the freezing point and the point where melted wax begins to coagulate will be twice as great, or 110 degrees will be twice as long, in one as in the other. Therefore each degree will be twice as long in the former thermometer as in the latter. But by the supposition, one of these thermometers in a given degree of heat will vary twice as much as the other does; and consequently, whatever heat raises the former one degree, will likewise raise the latter one degree.
If the ball of a thermometer is dipped into hot water, the fluid in the thermometer will sink a little before it begins to rise.

Not only fluids, such as spirits, oil, or mercury, but likewise glass or iron, or almost any hard bodies, will expand when they are heated, and will contract again when they grow cold. Now, when the ball of a thermometer is dipped into hot water, the heat will be communicated to the glass of which the ball is made, before it is communicated to the fluid contained in the ball. By this means the ball will be expanded, and the capacity of it will be increased, so that some of the fluid will sink out of the item into it. But when the ball has been long enough in the water for the fluid within it to be heated, this fluid will be expanded, and then it will rise into the item, and will continue to rise as the heat increases.

Of Sound.

Sound, in the body that produces it, is a trembling motion; this motion is communicated to the air, and conveys it to the ear.

When any elastic body is struck, so as to produce a sound, the body, or some part of it, is made to vibrate. This is evident to see in the strings of a violin or harpsichord; for either the eye may see, or the hand may feel, the trembling of the strings, when by striking them they are made to sound. See Music.

If a bell is struck by its clapper on the inside, the bell is made to vibrate. The base of the bell is a circle; but by striking any part of this circle on the outside, the part which is struck will fly out a little way, so that the diameter, which passes through this part of the circular base, will become longer than another diameter which crosses this at right angles. Therefore by the stroke the base will be changed into an ellipsis, whose longer axis will pass through the part against which the clapper struck. But the elasticity of the bell will restore the figure of the base, and will make the part which was forced out of its place return back. This part in returning will acquire velocity in the same manner as an elastic string would in the same circumstances. And since it acquires velocity in returning to its place, it will not stop at that place, but will continue to rise as the heat increases. Therefore by the stroke the base will be changed into an ellipsis again; only now the shorter axis will pass through the part that was first struck. If the bell was to be struck at first by a hammer on the outside, the part struck would move inwards; and such a motion would likewise change the base into an ellipsis: only in this case the short axis of the ellipsis would pass through that part where the blow was given. The elasticity of the bell will restore its figure; and as the part which was struck will acquire velocity in returning to its proper situation, the acquired velocity will not suffer it to rest there, but will carry it farther out from the opposite side, and the base will by this means be again changed into an ellipsis, having the longer axis at that part where the blow was given. Thus we have seen that wherever the bell is struck, the parts of it will perform one vibration; the part which is struck will yield to the blow; the elasticity of the bell will bring it back to its former situation; in returning, it will acquire velocity; and as far as the blow had driven it one way, so far the acquired velocity will carry it the other. But since, after one vibration is thus performed, the figure of the base will be elliptical; the parts of the bell will vibrate a second time; and so on, in the same manner that an elastic string vibrates.

The same stroke which makes a bell vibrate makes it found too, and as the vibrations decay, the sound grows weaker. Our senses may convince us that the parts of a bell are in a trembling or vibratory motion whilst the bell sounds: for if we lay our hand upon it, we may feel it jar; or if small straws or pieces of paper are thrown upon it, we may see that the jarring or trembling of the bell will put them in motion.

But the air must convey this vibratory motion to the ear: for otherwise, though the sounding body is made to vibrate, no sound will be heard. Thus if a bell is rung in the receiver of an air-pump, the sound will grow weaker as the air is exhausted; and when all the air is drawn out of the receiver, no sound at all will be heard. When the air is admitted again into the receiver, the sound will at the first entrance of the air begin to be heard, and will grow louder as more air returns. If the bell was to be rung in like manner in a vessel where the air is condensed, the sound of it would be much louder than it is in common air. And accordingly, when divers are let down to any great depth of water, because the air in the diving-bell is much condensed, they seem to one another to speak much louder than usual.

The intensity of sound, at different distances from the sounding body, is inversely as the squares of the distances.

Sounds may differ from one another, both in respect of their tone, and in respect of their intensity or strength. In respect of their tone, they are distinguished into grave and acute; in respect of their intensity, they are distinguished into loud or strong, and low or weak. The tone of any sound depends upon the time that an impression continues, and is not altered by the distance of the ear from the sounding body. But the intensity or strength of any sound depends upon the force with which the particles of air, as they are condensed, strike the ear; and this force is found to be different at different distances, so that a sound which is very loud if we are near the body that produces it, would be weaker if we were farther from it, and our distance from it may be so great that we cannot hear it at all.

The proportion in which the intensity of sound decreases, as the distance of the ear from the sounding body increases, is this: If the different distances at which the ear is placed are to one another as 1, 2, 3, 4, 5; then the squares of those distances are 1, 4, 9, 16, 25; and the intensity of sound will be inversely as the squares, or as the reciprocals of the squares; that is, the strength of the sound will decrease in the same proportion with the fractions, \( \frac{1}{1}, \frac{1}{2}, \frac{1}{3}, \frac{1}{4}, \frac{1}{5} \), which are the reciprocals of 1, 4, 9, 16, 25. This is what we mean when we say that the intensity of sound is inversely as the squares of the distances, or that it decreases in the departure of the ear from the sounding body in the same proportion that the squares of the distances increase.

The intensity of sound decreases as the vibrations in the sounding body grow weaker.

If an elastic string was to stop all at once, the sound produced by it would cease immediately. But if the vibrations of
of the string decay gradually, the sound will likewise keep growing weaker, till it becomes too weak to be heard. The string performs all its vibrations from the first to the last in equal times, and consequently each pulse that the string produces is produced in an equal time, and upon that account each pulse from the first to the last will have the same thickness. But when the thickness of the pulse is given, the quantity of air, or number of particles, by which the ear is struck, will likewise be given; and the moment with which it is struck, or the intensity of the sound, will be as the velocity with which the particles move. Now the velocity of the string is successively communicated to the particles of air, as they are made to vibrate. Therefore, as the velocity of the string decays, the velocity of the particles, and consequently the intensity of the sound, will likewise decay.

The intensity of sound is increased by a speaking-trumpet.

When a man speaks without such a trumpet, the pulses, as they are produced, dilate themselves in all directions, or the motion is immediately communicated to the air all round him. But if he speaks in a trumpet, his voice, that is, the motion produced by his voice, is confined to the small portion of air contained in the trumpet. For this reason, as there are fewer particles to be moved than there are when the motion dilates itself immediately in all directions, the motion that is communicated will be greater, and consequently, when the voice comes out of the trumpet, its intensity or strength will be greater, than it would have been if it had been propagated in all directions at first.

Sound moves with the same velocity at all distances from the sounding body.

The sound of a cannon, or of a bell, moves at the rate of 1142 feet in a second at all distances from the gun or the bell. If it moves at this rate for the first mile, it would move just at the same rate for the second mile; so that a person who is within one mile of the cannon when it is discharged, will hear the report just as soon again as another who is at the distance of two miles. The velocity of the sound does not decrease as it is propagated forwards, but continues the same from the first to the last. This property of sound has been proved by repeated experiments.

When sound strikes against an obstacle, it will be reflected.

By sound we here mean the pulses in the air, which are, properly speaking, the cauſes of sound. If these pulses in their progress strike upon any obstacle, fuch as a rock, a thick wood, or the side of a building, the air, which is condensed at the obstacle, is prevented from expanding itself forwards, or from propagating the sound beyond the obstacle. Therefore, in expanding itself, the motion, which would otherwise have been propagated forwards, will be returned from the obstacle; and a person, who is placed so as to receive the pulses in their return, will hear the sound by reflection. Such a reflected sound is called an echo.

The number of syllables which an echo repeats distinctly depends upon the distance of the obstacle from whence the sound is reflected. The syllables that we hear distinctly repeated are those which are returned after we have done speaking. Therefore, if the obstacle is so near to us, that the first syllable we speak will be returned before we can speak a second, no reflected sound at all can be heard distinctly; because the direct and reflected sound, or the voice and the echo, will be confounded with one another. If the obstacle is at such a distance, that five syllables may be spoken before one will be returned; then if we speak a sentence consisting of ten syllables, the first five will be reflected whilst we are speaking the five last, so that in speaking the five last syllables the voice will be confounded with the echo of the five first, and we shall hear the echo of only the five last syllables distinctly, because the other will be returned after we have done speaking. But if the obstacle is at such a distance, that we may speak ten syllables before the first of them will return to the speaker; then if we speak a sentence consisting of only ten syllables, we shall have done speaking before the echo begins, and consequently we may hear the whole sentence distinctly repeated by the echo.

Sometimes the same sound is frequently repeated by an echo. This happens when there are several obstacles at different distances. For though there are several obstacles, yet if all of them are at the same distance, the sound will be returned from them all at one and the same time; and consequently the several reflected sounds will be heard together, and will make but one echo. But if the obstacles are at different distances, each will return the sound at a different time, and as many echoes will be heard as there are obstacles that produce them.

The Diving Bell.

The air in a diving-bell is compressed by the weight of the atmosphere before the bell is let down into the water. But when it has sunk 35 feet below the surface, the air contained in it is compressed by the weight of the atmosphere as before, and by the weight of 35 feet of water besides, which is equivalent to another atmosphere. Therefore the compressing force at this depth is doubled, and consequently the air in the bell will then be twice as dense as the common air that we breathe. As much air, likewise, as just fills the bell, when it is at the surface of the water, will, at the depth of 35 feet, only fill half of it; for as the compressing force is doubled, the same quantity of air will be reduced to half its usual dimensions. For this reason, the water would rise into the bell through the bafe or bottom of it, which is always open, and would fill the other half of it, if there was not a contrivance for bringing down additional air enough to force out this water, and to keep the whole capacity of the bell full of air. However, the air which fills it will, at the depth of 35 feet, have twice the density that common air has; and at the depth of 70 feet, where it will be compressed by the weight of another atmosphere, it will have three times the density of common air.

We shall here give a short account of the contrivance for bringing down additional air to the diving-bell; because it will serve to shew, that if a vessel full of air is sunk into water, and the water communicates with the air in the vessel, then the pressure upon that air will be so much the greater as the vessel is sunk farther below the surface of the water. The contrivance is this. A barrel is made use of, which has one bung-hole in the lower part of it, and another in the upper part. A leather pipe is fastened to the hole in the upper part; and this pipe is so long, that, when it hangs down on the outside of the barrel, its orifice reaches below the bung hole in the lower part. If this barrel, by the help of weights fastened to it, is made to sink with its bottom downwards, the water, by pressing against the lower bung-
bung hole, will condense the air contained in the barrel: for, notwithstanding this pressure, none of the air can escape through the upper hole, because it is kept in by a greater pressure against the orifice of the leathern pipe which hangs below the bottom of the barrel, and consequently, being deeper in the water, sustains a greater pressure than what acts against the lower bung-hole. If the barrel is let down in this manner, till it gets below the bell, and then the end of the leathern pipe is lifted up into the bell; the lower bung-hole will then be more pressed than the orifice of the pipe; and therefore the air contained in the barrel will be driven up through the pipe, and will be received into the bell. And because the barrel is deeper in the water than the bell is, the water will press more against the base of the barrel to force the air out of it than it does against the base of the bell: for which reason the air will rush out of the barrel with force enough to drive out any water which had risen into the bell whilst it was descending.

By the same contrivance, fresh air is brought down to the bell as often as there is occasion for it. The air, which has been heated by frequently breathing it, is let out through a flap cock in the top of the bell and rises in bubbles to the surface of the water, whilst fresh air is received from the leathern pipe of a barrel contrived in the manner already described.

**AIR necessary for the LIFE of ANIMALS.**

All common air is impregnated with a certain kind of vivifying spirit or quality, which is necessary to continue the lives of animals: and this, in a gallon of air, is sufficient for one man during the space of a minute, and not much longer.

This spirit in air is destroyed by passing through the lungs of animals; and hence it is, that an animal dies soon, after being put under a vessel which admits no fresh air to come to it. This spirit is also in the air which is in water; for fishes when they are excluded from fresh air, as in a pond that is closely frozen over, and the little eggs of fish swim up in a glass, do not produce their young, though suffered by a kindly warmth. The seeds also of plants mixed with good earth, and enclosed in a glass, will not grow.

This enlivening quality in air is also destroyed by the air's passing through fire; particularly charcoal fire, or the flame of sulphur. Hence smoking chimneys must be very unwholesome, especially if the rooms they are in be small and close. See Smokes.

Air is also vitiated, by remaining closely pent up in any place for a considerable time; or perhaps, by being mixed with malignant fumes and particles flowing from the neighbouring bodies; or lastly, by the corruption of the vivifying spirit, as in the holds of ships, in oil-cisterns, or wine-cellar, which have been shut up for a considerable time. The air in any of them is sometimes so much vitiated, as to be immediate death to any animal that comes into it.

Air that has lost its vivifying spirit is called damp, not only because it is filled with humid or moist vapours; but because it deadens fire, extinguishes flame, and destroys life. The dreadful effects of damp are sufficiently known to such as work in mines.

The atmosphere is the common receptacle of all the effluvia or vapours arising from different bodies: of the fumes and smoke of things burnt or melted; the fogs or vapours proceeding from damp watery places; and of effluvia from sulphurous, nitrous, acid, and alkaline bodies. In short, whatever may be called volatile, rises in the air to greater or less heights, according to its specific gravity.

When the effluvia which arise from acid and alkaline bodies meet each other in the air, there will be a strong conflict or fermentation between them; which will sometimes be so great, as to produce a fire; then if the effluvia be combustible, the fire will run from one part to another, just as the inflammable matter happens to lie.

Any one may be convinced of this, by mixing an acid and an alkaline fluid together, as the spirit of nitre and oil of cloves; upon the doing of which, a sudden fermentation, with a fine flame, will arise; and if the ingredients be very pure and strong, there will be a sudden explosion.

Whoever considers the effects of fermentation, cannot be at a loss to account for the dreadful effects of thunder and lightnings: (see Electricity:) For the effluvia of sulphurous and nitrous bodies, and others that may rise into the atmosphere, will ferment with each other, and, take fire very often of themselves; sometimes by the assistance of the sun's heat.

If the inflammable matter be thin and light, it will rise to the upper part of the atmosphere, where it will flash without doing any harm; but if it be dense, it will lie nearer the surface of the earth, where taking fire, it will explode with a surprising force; and by its heat rarefy and drive away the air, kill men and cattle, split trees, walls, rocks, &c. and be accompanied with terrible claps of thunder.

The heat of lightening appears to be quite different from that of other fires; for it has been known to run through wood, leather, cloth, &c. without hurting them, while it has broken and melted iron, steel, silver, gold, and other hard bodies. Thus it has melted or burnt afunder a sword, without hurting the scabbard; and money in a man's pocket, without hurting his fingers: the reason of this seems to be, that the particles of the fire are so fine, as to pass through soft loose bodies without difolving them; whilst they spend their whole force upon the hard ones.

It is remarkable, that knives and forks which have been struck with lightening have a very strong magnetical virtue for several years after.

Much of the same kind with lightening, are those explovions, called fulminating or fire-damps, which sometimes happen in mines; and are occasioned by sulphureous and nitrous, or rather oleaginous particles, rising from the mine, and mixing with the air, where they will take fire by the lights which the workmen are obliged to make use of. The fire being kindled will run from one part of the mine to another, like a train of gunpowder, as the combustible matter happens to lie. And as the elascity of the air is increased by heat, that in the mine will consequtely swell very much, and so, for want of room, will explode with a greater or less degree of force, according to the density of the combustible vapours. It is sometimes so strong as to blow up the mine; and at other times so weak, that when it has taken fire at the flame of a candle, it is easily blown out.

Air that will take fire at the flame of a candle may be produced thus. Having exhausted a receiver of the air-pump; let the air run into it through the flame of the oil of turpentine; then remove the cover of the receiver; and holding a candle to that air, it will take fire, and burn quicker or slower, according to the density of the oleaginous vapour.

When such combustible matter, as is above-mentioned, kindles...
kindles in the bowels of the earth, where there is little or no vent, it produces earthquakes, and violent storms or hurricanes of wind when it breaks forth into the air.

An artificial earthquake may be made thus. Take 10 or 15 pounds of sulphur, and as much of the filings of iron, and knead them with common water into the confections of a paste; this being buried in the ground, will, in 8 or 10 hours time, burst out in flames, and cause the earth to tremble all around to a considerable distance.

From this experiment we have a very natural account of the fire of Mount Etna, Veluvius, and other volcanos, they being probably fed on fire at first by the mixture of such metals: the fire of Mount Etna, Veluvius, and other volcanos, they being probably fed on fire at first by the mixture of such metals.

Of the Air-Pump.

The air-pump being in effect the same as the water-pump, (see Hydrostatics,) whoever understands the one will be at no loss to understand the other.

Having put a wet leather on the plate LL of the air-pump, (Plate CXLV. fig. 8.) place the glass receiver M upon the leather, so that the hole i in the plate may be within the glass. Then, turning the handle F backward and forward, the air will be pumped out of the receiver; which will then be held down to the plate by the pressure of the external air or atmosphere. For, as the handle (fig. 9.) is turned backwards, it raises the piston de in the barrel BK, by means of the wheel F and rack DD; and as the piston is levered so tight, as to fit the barrel exactly, no air can get between the piston and barrel; and therefore, all the air above d in the barrel is lifted up towards B, and a vacuum is made in the barrel from e to b; upon which, part of the air in the receiver M (fig. 8.) by its spring, rushes through the hole i, in the brass plate LL, along the pipe CG (which communicates with both barrels by the hollow trunk I HK (fig. g) and, pulling up the valve b, enters into the vacant place be of the barrel BK. For, where-ever the resistance or pressure is taken off, the air will run to that place, if it can find a passage. — Then, as the handle F will be turned forward, the piston de will be depressed in the barrel; and, as the air which had got into the barrel cannot be pushed back through the valve b, it will ascend through a hole in the piston, and escape through a valve at d; and be hindered by that valve from returning into the barrel, when the piston is again raised. At the next raising of the piston, a vacuum is again made in the same manner as before, between b and e; upon which more of the air, which was left in the receiver M, gets out thence by its spring, and runs into the barrel BK, through the valve B. The same thing is to be understood with regard to the other barrel AI, and as the handle F is turned backwards and forwards, it alternately raises and depresses the pistons in their barrels, always raising one whilst it depresses the other. And, as there is a vacuum made in each barrel when its piston is raised, every particle of air in the receiver M pushes out another, by its spring or elasticity, through the hole i and pipe CG, into the barrels, until at last the air in the receiver comes to be so much diluted, and its spring so far weakened, that it can no longer get through the valves; and then no more can be taken out. Hence there is no such thing as making a perfect vacuum in the receiver: for the quantity of air taken out at any one stroke, will always be as the density thereof in the receiver: and therefore it is impossible to take it all out, because, supposing the receiver and barrels of equal capacity, there will be always as much left as was taken out at the last turn of the handle.

There is a cock k below the pump-plate, which being turned lets the air into the receiver again; and then the receiver becomes loose, and may be taken off the plate. The barrels are fixed to the frame Eee by two srew-nuts ff, which press down the top piece E upon the barrels; and the hollow trunk H (in fig. 9.) is covered by a box, as GH in fig. 8.

There is a glass tube lmmn open at both ends, and about 34 inches long; the upper end communicating with the hole in the pump-plate, and the lower end immersed in quicksilver at n in the vessel N. To this tube is fitted a wooden ruler mm, called the gage, which is divided into inches and parts of an inch, from the bottom at n (where it is even with the surface of the quicksilver) and continued up to the top, a little below l, to 30 or 31 inches.

As the air is pumped out of the receiver M, it is likewise pumped out of the glass tube lmn, because that tube opens into the receiver through the pump-plate; and as the tube is gradually emptied of air, the quicksilver in the vessel N is forced up into the tube by the pressure of the atmosphere. And if the receiver could be perfectly exhausted of air, the quicksilver would stand as high in the tube as it does at that time in the barometer: for it is supported by the same power or weight of the atmosphere in both.

The quantity of air exhausted out of the receiver on each turn of the handle, is always proportionable to the ascent of the quicksilver on that turn; and the quantity of air remaining in the receiver, is proportionable to the defect of the height of the quicksilver in the gage, from what it is at that time in the barometer.

EXPERIMENTS WITH THE AIR-PUMP.

1. To shew the resistance of the air.

1. There is a little machine, consisting of two mills, a and b, (ibid. fig. 10.) which are of equal weights, independent of each other, and turn equally free on their axes in the frame. Each mill has four thin arms or fail fixed into the axis; those of the mill a have their planes at right angles to the axis, and those of b have their planes parallel to it. Therefore, as the mill a turns round in common air, it is but little resisted thereby; because its sides cut the air with their thin edges; but the mill b is much resisted, because the broad sides of its slats move against the air when it turns round. In each axle is a pin near the middle of the frame, which goes quite through the axle, and stands out a little on each side of it; upon these pins, the slider d may be made to bear, and so hinder the mills from going when the strong spring c is set on bend against the opposite ends of the pins.

Having set this machine upon the pump-plate LL (fig. 8.) draw up the slider d to the pins on one side, and let the spring c at bend upon the opposite ends of the pins; then push down the slider d, and the spring acting equally strong on each mill, will let them both along with equal forces and velocities: but the mill a will run much longer than the mill b, because the air makes much less resitance against the edges of its slats than against the sides of the fails of b.
Draw up the slider again, and set the spring upon the pins as before; then cover the machine with the receiver \( M \) (fig. 8.), upon the pump-plate, and having exhausted the receiver of air, push down the wire \( PP \) (through the collar of leathers in the neck \( q \)) upon the slider; which will diffuse it from the pins, and allow the mills to turn round by the impulse of the spring; and as there is no air in the receiver to make any sensible resistance against them, they will both move a considerable time longer than they did in the open air; and the moment that one stops, the other will do so too. This shows that air resists bodies in motion, and that equal bodies meet with different degrees of resistance, according as they present greater or less surfaces to the air, in the planes of their motions.

2. Take off the receiver \( M \) (fig. 11.) and the mills; and having put the guinea \( a \) and feather \( b \) upon the brass flap \( c \), turn up the flap, and shut it into the notch \( d \). Then, putting a wet leather over the top of the tall receiver \( AB \) (it being open both at top and bottom) cover it with the plate \( C \) from which the guinea and feather tongs \( ed \) will then hang within the receiver. This done, pump the air out of the receiver; and then draw up the wire \( f \) a little, which by a square piece on its lower end will open the tongs \( ed \); and the flap falling down, as at \( e \), the guinea and feather will descend with equal velocities in the receiver; and both will fall upon the pump-plate at the same instant. N.B. In this experiment, the observers ought not to look at the top, but at the bottom of the receiver; in order to see the guinea and feather fall upon the plate; otherwise, on account of the quickness of their motion, they will escape the sight of the beholders.

II. To shew the weight of the air.

1. Having fitted a brass cap, with a valve tied over it, to the mouth of a thin bottle or Florence flask, whose contents are exactly known, screw the neck of this cap into the hole \( i \) of the pump-plate; then, having exhausted the air out of the flask, and taken it off from the pump, let it be suspended at one end of a balance, and nicely counterpoise it by weights in the scale at the other end; this done, raise up the valve with a pin, and the air will rush into the flask with an audible noise; during which time, the flap will descend, and pull down the end of the beam. When the noise is over, put as many grains into the scale as will restore the equilibrium; and they will shew exactly the weight of the quantity of air which has got into the flask, and filled it. If the flask holds an exact quart, it will be found, that 17 grains will restore the equipoise of the balance, when the quicksilver stands at 29½ inches in the barometer; which shews, that when the air is at a mean rate of density, a quart of it weighs 17 grains; it weighs more when the quicksilver stands higher, and less when it stands lower.

2. Place the small receiver \( O \) (fig. 8.) over the hole \( i \) in the pump-plate; and upon exhausting the air, the receiver will be fixed down to the plate by the pressure of the air on its outside, which is left to act alone, without any air in the receiver to act against it; and this pressure will be equal to as many times 15 pounds, as there are square inches in that part of the plate which the receiver covers; which will hold down the receiver so fast, that it cannot be got off, until the air be let into it by turning the cock \( k \); and then it becomes loose.

3. Set the little glass \( AB \) (fig. 12.) (which is open at both ends) over the hole \( i \) upon the pump-plate \( LL \), and put your hand close upon the top of it at \( B \); then, upon exhausting the air out of the glass, you will find your hand precluded with a great weight upon it; so that you can hardly release it, until the air be re-admitted into the glass by turning the cock \( k \); which air, by acting strongly against the hand as the external air acted in pressing it downward, will release the hand from its confinement.

4. Having tied a piece of wet bladder \( b \) (fig. 13.) over the open top of the glass \( A \) (which is also open at bottom) let it to dry, and then the bladder will be tight as a drum. Then place the open end \( A \) upon the pump-plate, over the hole \( i \), and begin to exhaust the air out of the glass. As the air is exhausting, its spring in the glass will be weakened, and give way to the pressure of the outward air on the bladder, which, as it is precluded, will put on a spherical concave figure, which will grow deeper and deeper, until the strength of the bladder be overcome by the weight of the air; and then it will break with a report as loud as that of a gun—If a flat piece of glass be laid upon the open top of this receiver, and joined to it by a flat ring of wet leather between them; upon pumping the air out of the receiver, the pressure of the outward air upon the flat glass will break it all to pieces.

5. Immerse the neck \( cd \) (fig. 14.) of the hollow glass ball \( eb \) in water, contained in the phial \( aa \); then set it upon the pump-plate, and cover it and the hole \( i \) with the clothe receiver \( A \); and then begin to pump out the air. As the air goes out of the receiver by its spring, it will also by the same means go out of the hollow ball \( eb \), through the neck \( de \), and rise up in bubbles to the surface of the water in the phial: from whence it will make its way, with the rest of the air in the receiver, through the air-pipe \( GG \) and valves \( a \) and \( b \), into the open air. When it has done bubbling in the phial, the ball is sufficiently exhausted; and then, upon turning the cock \( k \), the air will get into the receiver, and press upon the surface of the water in the phial, as to force the water up into the ball in a jet; through the neck \( cd \), and will fill the ball almost full of water. The reason why the ball is not quite filled, is because all the air could not be taken out of it; and the small quantity that was left in, and had expanded itself so as to fill the whole ball, is now condensed into the same article, as the outer air, and remains in a small bubble at the top of the ball; and so keeps the water from filling that part of the ball.

6. Pour some quicksilver into the jar \( D \) (fig. 15.), and set it upon the pump-plate near the hole \( i \); then set on the tall open receiver \( AB \), so as to be over the jar and hole; and cover the receiver with the brass plate \( C \). Screw the open glass tube \( fg \) (which has a brass top on it at \( h \)) into the syringe \( H \); and putting the tube through a hole in the middle of the plate, so as to immerse the lower end of the tube \( e \) in the quicksilver at \( D \), screw the end \( h \) of the syringe into the plate. This done, draw up the piston in the syringe by the ring \( L \), which will make a vacuum in the syringe below the piston; and as the upper end of the tube opens into the syringe, the air will be dilated in the tube, because part of it, by its spring, gets up into the syringe; and the spring of the undilated air in the receiver acting upon the surface of the quicksilver in the jar, will force part of it up into the tube: for the quicksilver will follow the piston in the syringe, in the same way, and for the same reason, that wa-
The weight of the column in the tube is the same as the very near as high as it lands at that time in the barometer. quicksilver, and reaching from the earth to the top of the ported in the barometer by the pressure of the air on its jiilver will rise into it, because there is no air left in the receiver, and it will also come out of the tube, because the tube is close at top. When the gauge moves, the receiver is well exhausted, pull down the tube, so as to immerse its lower end into the quicksilver in the jar. Now, although the tube be exhausted of air, none of the quicksilver will rise into it, because there is no air left in the receiver to press upon its surface in the jar. But let the air into the receiver by the cock k, and the quicksilver will immediately rise in the tube; and stand as high in it, as it was pumped up in the last experiment.

Both these experiments shew, that the quicksilver is supported in the barometer by the pressure of the air on its surface in the box, in which the open end of the tube is placed; and that the more dense and heavy the air is, the higher does the quicksilver rise; and, on the contrary, the thinner and lighter the air is, the more will the quicksilver fall. For, if the handle P be turned ever so little, it takes some air out of the receiver, by raising one or other of the pistons in its barrel; and consequently, that which remains in the receiver is so much the rarer, and has so much the less spring and weight; and therefore, the quicksilver falls a little in the tube; but upon turning the cock, and admitting the air into the receiver, it becomes as weighty as before, and the quicksilver rises again to the same height. Thus we see the reason why the quicksilver in the barometer falls before rain or snow, and rises before fair weather; for, in the former case, the air is too thin and light to bear up the vapours, and in the latter too dense and heavy to let them fall.

N. B. In all mercurial experiments with the air-pump, a short pipe must be screwed into the hole i, so as to rise about an inch above the plate, to prevent the quicksilver, from getting into the air-pipe and barrels, in case any of it should be accidentally spilt over the jar; for if it once gets into the pipes or barrels, it spoils them, by loosening the folder, and corroding the brass.

8. Take the tube out of the receiver, and put one end of a bit of dry hazel-branch, about an inch long, tight in the hole, and the other end tight into a hole quite through the bottom of a small wooden cup; then pour some quicksilver into the cup, and exhaust the receiver of air; and the pressure of the outward air, on the surface of the quicksilver, will force it through the pores of the hazel, from whence it will descend in a beautiful shower into a cup placed under the receiver to catch it.

9. Put a wire through the collar of leathers in the top of the receiver, and fix a bit of dry wood on the end of the wire within the receiver; then exhaust the air, and pull the wire down, so as to immerse the wood into a jar of quicksilver on the pump-plate: this done, let in the air; and upon taking the wood out of the jar, and splitting it, its pores will be found full of quicksilver, which the force of the air, upon being let into the receiver, drove into the wood.

10. Join the two brass hemispherical cups A and B (fig. 17.) together, with a wet leather between them, having a hole in the middle of it; then screw the end D of the pipe CD into the plate of the pump at i, and turn the cock E; so the pipe may be open all the way into the cavity of the hemispheres; then exhaust the air out of them, and turn the cock a quarter round, which will shut the pipe CD, and keep out the air. This done, unscrew the pipe at D from the pump, and screw the piece Fh upon it at D; and let two strong men try to pull the hemispheres asunder by the rings g and h, which they will find hard to do; for if the diameter of the hemispheres be four inches, they will be pressed together by the external air with a force equal to 188 pounds. And to shew that it is the pressure of the air that keeps them together, hang them by either of the rings upon the hook P of the wire in the receiver M (fig. 8.) upon exhausting the air out of the receiver, they will fall asunder of themselves.

11. Place a small receiver O (fig. 8.) near the hole i on the pump-plate, and cover both it and the hole with the receiver M; and turn the wire so by the top P, that its hook may take hold of the little receiver by a ring at its top, allowing that receiver to stand with its own weight on the plate. Then, upon working the pump, the air will come out of both receivers; but the large one M will be forcibly held down to the pump by the pressure of the external air; whilst the small O, having no air to press upon it, will continue loose, and may be drawn up and let down at pleasure, by the wire PP. But, upon letting it quite down to the plate, and admitting the air into the receiver M, by the cock k, the air will press so strongly upon the small receiver O, as to fix it down to the plate; and at the same time, by counterbalancing the outward pressure on the large receiver M, it will become loose. This experiment evidently shews, that the receivers are held down by pressure, and not by suction, for the internal receiver continued loose whilst the operator was pumping, and the external one was held down: but the former became fast immediately, by letting in the air upon it.

12. Screw the end A (fig. 18.) of the brass pipe ABF into the hole of the pump-plate, and turn the cock e until the pipe be open; then put a wet leather upon the plate cd, which...
which is fixed on the pipe, and cover it with the tall receiver $GH$, which is close at top; then exhaust the air out of the receiver, and turn the cock $e$ to keep it out; which done, unscrew the pipe from the pump, and set its end $A$ into a basin of water, and turn the cock $e$ to open the pipe; on which, as there is no air in the receiver, the pressure of the atmosphere on the water in the basin will drive the water forcibly through the pipe, and it will play up in a jet to the top of the receiver.

13. Set the square phial $A$ (fig. 21.) upon the pump-plate; and having covered it with the wire-cage $B$, put a clofe receiver over it, and exhaust the air out of the receiver; in doing of which, the air will also make its way out of the phial through a small hole in its neck under the valve $b$. When the air is exhausted, turn the cock below the plate, to re-admit the air into the receiver; and as it cannot get into the phial again, because of the valve, the phial will be broke into some thousands of pieces by the pressure of the air upon it. Had the phial been of a round form, it would have sustained this pressure like an arch, without breaking; but as its sides are flat, it cannot.

To prove the elasticity or spring of the air.

14. Tie up a very small quantity of air in a bladder, and put it under a receiver; then exhaust the air out of the receiver, and the small quantity which is confined in the bladder (having nothing to act against it) will expand itself so by the force of its spring, to fill the bladder as full as it could be blown of common air. But upon letting the air into the receiver again, it will overpower the air in the bladder, and press its sides almost close together.

15. If the bladder so tied up be put into a wooden box, and have 20 or 30 pounds weight of lead put upon it in the box, and the box be covered with a clofe receiver; upon exhausting the air out of the receiver, that air which is confined in the bladder will expand itself so, as to raise up all the lead by the force of its spring.

16. Take the glass-ball mentioned in the fifth experiment, (fig. 14.), which was left full of water all but a small bubble of air at top, and having set it with its neck downward into the empty phial $aa$, and covered it with a clofe receiver, exhaust the air out of the receiver, and the small bubble of air in the top of the ball will expand itself, so as to force all the water out of the ball into the phial.

17. Screw the pipe $AB$ (fig. 18.) into the pump-plate, place the tall receiver $GH$ upon the plate $cd$, as in the twelfth experiment, and exhaust the air out of the receiver: then, turn the cock $e$, to keep out the air; unscrew the pipe from the pump, and screw it into the mouth of the copper vessel $CC$ (fig. 22.), the vessel having first been about half filled with water. Then turn the cock $e$ (fig. 18.) and the spring of the air which is confined in the upper vessel will force the water up through the pipe $AB$ in a jet into the exhausted receiver, as strongly as it did by its preffure on the surface of the water in a basin, in the twelfth experiment.

18. If a fowl, a cat, rat, a mouse, or bird, be put under a receiver, and the air be exhausted, the animal will be at first oppressed as with a great weight, then grow convulsed, and at last expire in all the agonies of a most bitter and cruel death.

19. If a butterfly be suspended in a receiver, by a fine thread tied to one of its horns, it will fly about in the receiver, as long as the receiver continues full of air; but if the air be exhausted, though the animal will not die, and continue to flutter its wings, it cannot remove itself from the place where it hangs in the middle of the receiver, until the air be let in again, and then the animal will fly about as before.

20. Pour some quicksilver into the small bottle $A$ (fig. 19.) and screw the brass collar $c$ of the tube $BC$ into the brass neck $b$ of the bottle, and the lower end of the tube will be immerfed into the quicksilver, so that the air above the quicksilver in the bottle will be confined there, because it cannot get out about the joinings, nor can it be drawn out through the quicksilver into the tube. This tube is also open at top, and is to be covered with the receiver $G$ and large tube $BP$, which tube is fixed by brass collars to the receiver, and is close at the top. This preparation being made, exhaust the air both out of the receiver and its tube; and the air will by the same means be exhausted out of the inner tube $BC$, through its open top at $C$; and as the receiver and tubes are exhausting, the air that is confined in the glass bottle $A$ will press its by its spring upon the surface of the quicksilver, as to force it up in the inner tube as high as it was raised in the ninth experiment by the pressure of the atmosphere; which demonstrates that the spring of the air is equivalent to its weight.

21. Screw the end $C$ (fig. 20.) of the pipe $CD$ into the hole of the pump-plate, and turn all the three cocks $d, G$, and $H$, so as to open the communications between all the three pipes $E, F, DC$, and the hollow trunk $AB$. Then, cover the plates $g$ and $b$ with wet leathers, which have holes in their middle where the pipes open into the plates; and place the clofe receiver $I$ upon the plate $g$: this done, flout the pipe $F$ by turning the cock $H$, and exhaust the air out of the receiver $I$. Then turn the cock $d$, to flout the air out; unscrew the machine from the pump; and having screwed it to the wooden foot $L$, put the receiver $K$ upon the plate $b$: this receiver will continue flooe on the plate as long as it keeps full of air; which it will do until the cock $H$ is turned to open the communication between the pipes $F$ and $E$, through the trunk $AB$; and then the air in the receiver $K$, having nothing to act against its spring, will run from $K$ into $I$, until it be so divided between these receivers, as to be of equal denfity in both; and they will be held down with equal forces to their plates by the pressure of the atmosphere, though each receiver will then be kept down but with one half of pressure upon it that the receiver $I$ had when it was exhausted of air; because it has now one half of the common air in it which filled the receiver $K$ when it was fet upon the plate; and therefore a force equal to half the force of the spring of common air will act within the receivers against the whole preflure of the common air upon their outsides. This is called transferring the air out of one vessel into another.

22. Put a cork into the square phial $A$, (fig. 21.) and fix it in with wax or cement; put the phial upon the pump plate with the wire-cage $B$ over it, and cover the cage with a clofe receiver. Then, exhaust the air out of the receiver; and the air that was corked up in the phial will break the phial outwards by the force of its spring, because there is no air left on the outside of the phial to act against the air within it.

23. Put a shrivelled apple under a clofe receiver, and exhaust the air; then the spring of the air within the apple will pump it out, so as to caufe all the wrinkles to disappear; but
but upon letting the air into the receiver again, to press upon the apple, it will instantly return to its former decayed and shrivelled state.

23. Take a fresh egg, and cut off a little of the shell and film from its smallest end; then put the egg under a receiver, and pump out the air; upon which, all the contents in the egg will be forced out into the receiver, by the expansion of a small bubble of air contained in the great end, between the shell and film.

24. Put some warm beer in a glass; and having set it on the pump, cover it with a close receiver, and then exhaust the air. Whilst this is doing, and thereby the pressure more and more taken off from the beer in the glass, the air therein will expand itself, and rise up in innumerable bubbles to the surface of the beer; and from thence it will be taken away with the other air in the receiver. When the receiver is near exhausted, the air in the beer, which could not disentangle itself quick enough to get off with the rest, will now expand itself so, as to cause the beer to have all the appearance of boiling; and the greatest part of it will go over the glass.

25. Put some warm water in a glass, and put a bit of dry wainscot or other wood into the water. Then, cover the glass with a close receiver, and exhaust the air; upon which, the air in the wood having liberty to expand itself, will come out plentifully, and make all the water to bubble about the wood, especially about the ends, because the pores lie lengthwise. A cubic inch of dry wainscot has so much air in it, that it will continue bubbling for near half an hour together.

Of WINDS.

As the air is a fluid, subject to the same laws of gravitation as other fluids, it necessarily has a constant tendency to preserve an equilibrium in every part; so that, if by any means whatever it is rendered lighter in any one place than another, the lighter air will rush in from every side towards this place, till as much be there accumulated as makes it of an equal weight with the rest of the atmosphere: It is these currents of air which are called winds.

Many are the causes which may vary the weight of the atmosphere, and occasion particular topical winds.

Although other causes may occasion winds in certain circumstances, yet their principal and most universal cause is the sun, which warmeth the air to a much greater degree in some places of the atmosphere than in others; and as the air is susceptible of a great degree of expansion by heat in those places where it is heated to any considerable degree, it is expanded so much as to become lighter than the air in those places where it is colder; so that the lighter cold air from all the circumjacent parts rushes towards this point to restore the equilibrium which had been destroyed. So that if there be any particular part upon the earth's surface where the sun acts contantly with greater force than on any other part, a current of air will constantly flow from these towards the warmer region; but the sun acts with greater force upon those parts of the earth which are nearest the Equator, than those which approach towards either Pole; so that we might naturally expect that a wind would constantly blow from the polar regions towards the Equator; which is really found to be the case in the Torrid Zone, where the influence of the sun overcomes almost all the other lesser causes which produce the variable winds in our more northerly regions. However, even in the Torrid Zone, these north and south winds are varied in different ways.

Although the heat of the equatorial region is greater than in any other: yet as the sun acts perpendicularly in his diurnal course upon one point of the earth only at one time, and immediately passes over it; and as the air retains the heat communicated to it by the sun but for a short time, cooling gradually as he retires, and continuing still to decrease till his influence again returns the following day; the degree of heat upon this great circle must be very different in different parts, and perpetually varying in every point; which must in some measure tend to disturb those winds coming from the polar regions, which we have already mentioned. To comprehend clearly what will be the effects of this rotation, let us consider what effect it would naturally produce upon the equator with regard to wind, supposing no other cause should interrupt it. And here we must observe, that as the point upon which the sun acts with the greatest power is constantly moving from east to west, the air to the east of that point over which the sun has more lately passed will be more rarified than that to the west, and will naturally flow towards that point from east to west with greater velocity than from west to east, as the cool air to the west of that point will be interrupted in its motion towards it by the motion of the sun meeting it. Hence therefore it follows, that from the diurnal motion of the earth from west to east a constant easterly wind would always be produced, were it not obstructed by other causes. But as there is a constant stream of air flowing from the polar regions towards the equatorial regions, a composition of these two currents of air acting at the same time will produce a north-easterly wind in all parts of the northern hemisphere, and a south-easterly wind in all parts of the southern one. These winds are known by the name of the general trade-winds.

If there were no inequalities on the surface of our globe, and if it were composed of a substance perfectly homogeneous, this wind would invariably take place at all times on every part of the earth's surface; but as this is not the case, it is liable to several very considerable variations. In all these regions towards the poles, as the influence of the sun is there but weak, other lesser causes occasion particular winds, and disturb that regularity which at first view we might expect, so that the general trade wind does not invariably take place beyond the 28th or 30th degree of latitude; and the regions between that and the poles have nothing but variable winds.

Even in the Torrid Zone, there are many causes which in particular places alter this direction of the wind; so that the genuine trade-winds do not take place except in the Atlantic and Pacific oceans on each side the equator to the distance of 28 or 30 degrees, and in the greatest part of the Indian ocean to the south of the Equator as appears, more distinctly upon the Map, see Plate CXLVI. where the course of the winds are marked by the direction of the arrows, the darts pointing in the same direction as the wind blows.

Having thus explained the nature and causes of the general trade wind, we now proceed to take notice of the principal deviations which take place in the Torrid Zone. The general trade-wind, when thus altered at particular stations, is known by the name of monsoons. There are other variations, which, although as general, are yet of smaller and more limited influence. These are known by the name of breezes; and as they blow periodically from the sea, they are denominated sea or land breezes, and take place more
or less in every sea coast within the tropics. As the causes of the monsoons will be more clearly comprehended after the nature of these breezes is explained, we shall first consider them.

The sea and land breezes of the Torrid Zone are gentle periodical winds regularly shifting twice every day, and blowing from the sea towards the land during the daytime, and from the land towards the sea in the night. These breezes do not blow with an equal degree of force throughout the whole day and night, but are perpetually varying, being always strongest about midday and midnight, and becoming gradually weaker till the time of change in the evening and morning; about which time the air continues for a short space perfectly calm; but in a little the breeze begins to be felt on the side opposite to that from which it blew last, so faint at first as hardly to be perceived; but by degrees acquiring greater strength, it goes on increasing for five or six hours, after which it again as gradually sinks and dies away. They always blow directly off or towards the shore, and never extend their influence to a great distance from it, although this is varied by particular circumstances in different places; as they never extend far from the points of capes and promontories, as in deep bays; nor upon the windward, as lee-shores.

These breezes are produced by the same cause which gives rise to the trade-wind, viz., the heat of the sun. In these warm regions the days and nights are nearly of an equal length throughout the whole year; the sun rising high in the daytime, and descending almost perpendicularly at night; which occasions a much greater variation between the heat of the day and night than is experienced in the more temperate climates; and it is this great difference between the heat of the night and day which produces the breeze. For the rays of the sun are reverberated from the land during the daytime, much more powerfully than from the sea, whose surface is constantly evaporating; and the air above the land is rendered much warmer, and consequently more rarified, than above the sea; so that a current of air necessarily takes place at that time from the sea towards the land, increasing and diminishing in strength as the heat increases or declines. But when the sun descends below the horizon, the evaporation from the surface of the sea is stopped, or greatly diminished, and the cold which it occasioned is of consequence removed: the reverberation of the sun’s rays from the surface of the earth is likewise removed, and the air above the land is quickly rendered its natural degree of cold, which is always greater than the sea, when the influence of the sun is withdrawn; so that the air above the sea becomes warmer during the night than that above the land, and a current of air is of course established from the land to the sea, which forms the land-breeze, which acts as uniformly, although less powerfully, than the sea-breeze; blowing at first gently as the air begins to cool, and gradually gathering strength as the sun retires below the horizon; till its influence begins to be felt again in the morning, when it gradually gives place to the more powerful influences of the sea-breeze. These breezes are not, however, entirely confined to the Torrid Zone. They are even felt in more northern regions: the sea-breeze in particular being almost perceptible during the summer season along the coasts of the Mediterranean and the Levant, both on the African, and European and Asiatic shores, as within the tropics. Even in our own colder climate, the effects of this are often distinctly felt during the summer season; although, from the length of the day and shortness of the night, the difference between the heat of these is far less than in warmer climates. And although the shortness of our nights prevents us from feeling a nocturnal breeze, similar to the land-breezes of the Torrid Zone; yet in every serene evening we have an opportunity of observing a phenomenon, proceeding from a similar cause with that which occasions them in warmer climates. For as the waters retain their heat longer than the earth after the sun withdraws, the moisture which was raised during the heat of the day to a small distance from the earth’s surface is quickly condensed by the cold of the evening, and falls down in copious dews; whereas that which is above the surface of the water is more slowly condensed, by reason of the heat which that element retains longer; and hovers at a small distance above it in the form of a dense vapour, which slowly subides as it loses its heat. This is the cause of those low mists which are so often seen hovering above the surface of rivers and other waters in the evenings towards the end of summer.

It was already observed, that in the Indian ocean the general trade-wind only took place in some parts to the south of the Equator. To the north of the line, and in some places to the south of it in that ocean, the general trade-wind only blows regularly for six months, and during the other six months the wind blows in a direction entirely opposite. It is these winds, which shift thus regularly, which are called Monsoons, although they are also sometimes called trade-winds.

At the Equator the days and nights are always of an equal length throughout the whole year; so that the heat being thus equally divided, it never arrives to such an intense degree as to be insupportable to the inhabitants. And as there is no vicissitude of seasons at the Equator, so at the Poles they never experience the more pleasing vicissitudes of day and night. The sun never setting during the summer season; and although the day decreases in length as we recede from the pole, from six months to twenty-four hours; yet in all high latitudes the sun descends for such a short space below the horizon, and in such an oblique direction, that the difference between the heat of the day and night is but very inconsiderable. From which it follows, that during this season, when the sun continues to act with such uninterrupted influence upon the surface of the earth, the air will then be rarified more above the dry land than upon the surface of the water; so that a wind would naturally set in at that time from the sea towards the land, similar to the diurnal sea-breezes in the warmer climates; and on the contrary, during the winter season, the air in these northern regions being colder above the land than the water, the winds will naturally blow from the land towards the sea, similar to the land-breezes of the Torrid Zone. But as the influence of the sun, although of longer continuance, is in general more languid in climates of a high latitude than in those near the line, it is not to be expected that these effects will follow with the same regularity as in the Torrid Zone: being more apt to be interrupted by leffer causes which affect the atmosphere and produce winds in different directions. Yet these are not so totally interrupted, but that we can easily trace their effects even in our own cold climate: For during the summer season, the large continent to the east of us, being more heated than the Atlantic ocean westward, produces...
A View of the General and

N. B. The arrows among the

N. B. The exact point where the S. E. and
of the wind on each side of the equator, at first
us more probable, that this point varies acci-
ations are wanting to confirm this.
Neither is it easy to ascertain, with precision,
to the south of the equator, extend west from
On the eastern part of this ocean, lying so much farther south than the kingdom of Arabia and Persia; so that these, being more heated than the ocean to the westward, naturally draw the winds towards them, and produce the easterly variation of the monsoon which takes place in this part of the ocean, while the warm and sandy deserts of Arabia draw the winds more directly northward near the African coasts.

In the eastern parts of the Indian ocean, beyond the island of Sumatra, and as far as the gulph of Siam, the bay of Tonquin, and along the southern parts of China, and among the Philippine islands, &c. to the north of the Equator, the monsoons observe a different direction, blowing nearly due south and north. Here the greatest part of the warm continent is to the west of this district, which makes the wind naturally assume this direction. A little to the east of this, among the Mariamne islands, the general trade-wind takes place, there being no continent to the north of them to occasion monsoons.

The monsoons are as regular in the eastern part of the Indian ocean to the south of the Equator, as they are to the north of it; as here a northern monsoon sets in from the month of October till April, and a southern from April till October. And here, as to the north of the line, we find the direction of the monsoons varying according to particular circumstances in different places: for about the island of Sumatra, and towards the west end of Java, the monsoons set in nearly from the north and south; but toward Celebes and Timur, they begin to tend a little more to the east and west, gradually declining as they approach the coast of New Guinea, near to which the northern monsoon from October till April blows from the N. W. and the opposite monsoon from the S. E. between October and April. The reader will easily perceive that these monsoons are occasioned by the continent of New Holland and Guinea, which being heated by the sun when in the southern signs, draws the wind towards that in the summer season, in the same manner as the continent of Asia produces the monsoons to the north of the line. And it is likewise sufficiently plain, that the influence of these periodical winds about Celebes and Timur is occasioned by that part of the continent called New Guinea, jutting out far to the north of the Equator, in which the wind is strong, and drawing the wind toward that quarter.

These are the most general and extensive monsoons which take place in our globe. But there are other periodical winds, which occur in particular places in the warm regions, that deserve particular attention.

In the Red-Sea, the monsoon shifts as regularly as in other places; but being influenced by the coasts, it tends a little more to the north and south than in the Indian ocean.

On the south coast of Africa, to the south of C. Corientes, and about the southern parts of the island of Madagascar, the regular trade-wind from the S. E. takes place between October and April; but from April till October the wind blows from the W. or N. W., and is at that season exceedingy cold. This is evidently occasioned by a cause already taken notice of: for, notwithstanding the high and cold nature of this continent, yet when the sun is to the south of the line, his powerful influence at that season so far abates their natural degree of cold, as not to interrupt the general trade-wind between the months of October and April. But when he returns to the northern hemisphere, the high mountains of Africa resume their native coldness, and repel the general trade-winds by their cold and more powerful

This being a general tendency of the current of air towards the east, inasmuch that westerly winds are observed to prevail more than any other, not only here, but in all the coasts of the ocean, the continental line, during the summer season. And easterly winds become again more prevalent in the winter and spring. On the contrary, it is observed in North America, that the easterly winds prevail more in summer than at any other time; and the westerly winds always prevail during the cold months of winter. The same effects take place with a greater degree of constancy in other parts of Europe, particularly in Greece, and the countries in that neighbourhood; as the ancient Greeks have particularly remarked, that the winds blew from the south during the heat of summer, particularly about the dog-days, and from the north during the colder weather of winter.

Any attentive reader, who has accompanied us thus far, will readily see, that the monsoons which take place in the Indian ocean proceed from the same general cause. For when the sun, in his annual course, has crossed the line, and comes to act very strongly upon the extensive countries of Arabia, Persia, China, and the other parts of India, these countries become heated to a much higher degree than the ocean to the south of them; and the air above these extensive countries being so much rarified, naturally draws the wind towards that place. which, by overcoming the general trade-wind, produces the southerly monsoons which take place in all those seas during the months of April, May, June, July, August, and September. But when the sun has again retreated towards the southern hemisphere, this great degree of heat in those countries subsides, and the genuine trade-wind again refumes its natural course; forming what they call the northerly monsoon, which blows in the months of October, November, December, January, February, and March: and as the continent of Asia now assumes a greater degree of cold than the Atlantic or Pacific oceans in the same latitude, it produces a brisker and more steady gale during the continuance of this monsoon, than is ever experienced in the general trade wind.

Having thus explained the nature of the monsoons in general, we shall proceed to consider the particular winds which influence the direction of these in those parts where they take place. In all that part of the Indian ocean which lies between the island of Madagascar and Cape Comorin, the wind blows constantly from the W. S. W. between the months of April and October; and in the opposite direction from the month of October till April, although with some variation in different places, as these winds are neither so strong nor constant in the Bay of Bengal as in the Indian ocean. And it is likewise remarkable, that the S. W. winds in these seas are generally more southerly on the African side, and more easterly on the Indian, as appears distinctly in the map. But these variations are not repugnant to the general theory. For it is sufficiently known, that high lands in every part of the globe are much colder than low and flat countries; and as that part of Africa is very high and mountainous, the cold in these regions is much greater than in the more flat countries of Arabia and India; so that the wind naturally blows from these cold regions, in the summer season, towards the warmer continent of Asia; which occasions those inflections of the wind to the easterly which take place in these seas during the summer months; and is still farther assisted by the peninsula of India, the kingdom of Siam, and the islands of Sumatra and Java, on the eastern part of this ocean, lying so much farther south than the kingdom of Arabia and Persia; so that these, being more heated than the ocean to the westward, naturally draw the winds towards them, and produce the easterly variation of the monsoon which takes place in this part of the ocean, while the warm and sandy deserts of Arabia draw the winds more directly northward near the African coasts.

In the eastern parts of the Indian ocean, beyond the island of Sumatra, and as far as the gulph of Siam, the bay of Tonquin, and along the southern parts of China, and among the Philippine islands, &c. to the north of the Equator, the monsoons observe a different direction, blowing nearly due south and north. Here the greatest part of the warm continent is to the west of this district, which makes the wind naturally assume this direction. A little to the east of this, among the Mariamne islands, the general trade-wind takes place, there being no continent to the north of them to occasion monsoons.

The monsoons are as regular in the eastern part of the Indian ocean to the south of the Equator, as they are to the north of it; as here a northern monsoon sets in from the month of October till April, and a southern from April till October. And here, as to the north of the line, we find the direction of the monsoons varying according to particular circumstances in different places: for about the island of Sumatra, and towards the west end of Java, the monsoons set in nearly from the north and south; but toward Celebes and Timur, they begin to tend a little more to the east and west, gradually declining as they approach the coast of New Guinea, near to which the northern monsoon from October till April blows from the N. W. and the opposite monsoon from the S. E. between October and April. The reader will easily perceive that these monsoons are occasioned by the continent of New Holland and Guinea, which being heated by the sun when in the southern signs, draws the wind towards that in the summer season, in the same manner as the continent of Asia produces the monsoons to the north of the line. And it is likewise sufficiently plain, that the influence of these periodical winds about Celebes and Timur is occasioned by that part of the continent called New Guinea, jutting out far to the north of the Equator, in which the wind is strong, and drawing the wind toward that quarter.

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In the Red-Sea, the monsoon shifts as regularly as in other places; but being influenced by the coasts, it tends a little more to the north and south than in the Indian ocean.

On the south coast of Africa, to the south of C. Corientes, and about the southern parts of the island of Madagascar, the regular trade-wind from the S. E. takes place between October and April; but from April till October the wind blows from the W. or N. W., and is at that season exceedingly cold. This is evidently occasioned by a cause already taken notice of: for, notwithstanding the high and cold nature of this continent, yet when the sun is to the south of the line, his powerful influence at that season so far abates their natural degree of cold, as not to interrupt the general trade-wind between the months of October and April. But when he returns to the northern hemisphere, the high mountains of Africa resume their native coldness, and repel the general trade-winds by their cold and more powerful...
ful blast, so as to produce the intertemporarv monsoon which here takes place between the months of April and October.

From Mozambique, to cape Guardafayo, at the mouth of the Red Sea, the monsoons are a little more irregular than in the other parts of the Indian ocean. For it is observed, that between October and January the winds are variable, although chiefly from the north. In January the N. E. monsoon sets in, and continues regular till the month of May. From May till October the winds again become variable, but blow chiefly from the southern points; but in the months of June, July, and August, there are frequent calms, especially about the bay of Melinda, which sometimes continue for several weeks together, and extend only about a hundred leagues from shore.

Before we can explain the cause of this irregularity clearly, it will be necessary to attend to the direction of the wind on each side of this track at each particular season. In the months of October, November, and December, the winds are here variable, but chiefly from the north. Now during these three months, the wind to the south of this beyond C. Corientes blows from the S. E. at the Red Sea, and all to the north of this the wind during this season of the year is from the N. E. And as the sun is then perpendicular to the bay of Melinda, those opposite winds here meeting and opposing one another, and being both of them frow in their course westward by the cold regions of Africa near the Mountains of the Moon, will naturally produce the variable winds here observed according as the one or the other of these three balancing powers shall predominate; although, as the coast here runs away towards the south-west, it is natural to expect that the northerly wind, which follows the same direction, should more frequently prevail than those which are opposed by it; especially when we consider, that the island of Madagascar, now beginning to be warmed by the influence of the sun, will concur in drawing the wind to the southward; and when the continent of Africa is more heated in the months of January and February, it does not oppose the easterly monsoon, so that the winds become then more fixed than before. But in the months of June, July, and August, the wind to the south of C. Corientes is from the N. W.; and near the Red Sea, and throughout the northern part of the Indian ocean, the S. W. monsoon is then in its greatest vigour; so that on each end of this district the wind is blowing in an opposite direction; from which results these calms about Melinda, which we just now mentioned.

This much may suffice for the shifting winds on the African and Asiatic coasts. As to America, the only places where the wind shifts regularly are, the bays of Honduras and Campeachy on the east, and that of Panama and some parts on the coast of Mexico on the west, with a small track upon the coast of Brazil. In the south part of the bay of Honduras, between C. Gratia de Dios and C. la Bela, the common trade-wind between E and NE blows between March and November; from October till March, there are westerly winds; not constant or violent, but blowing moderately sometimes two or three days, or a week; and then the easterly breeze may again prevail for an equal length of time. The reason of the peculiarity here observed is this. During the summer season, the high land on the Isthmus of Darien is so much warmed as not to interrupt the course of the general trade-winds. But when he retires to the southern hemisphere, the cold upon the Isthmus at that season becomes so great, as to condense the air to such a degree as to repel the trade-wind for some time: but not being cooled to such an intense degree as in some of the larger continents, the trade-wind at times overcomes and repels these land breezes in its turn, and produces the phenomena above described. And that this is really the case, appears evident from this circumstance, that the land-breezes are most prevalent and of longest duration in the colder months of December and January; before and after which two months, the trade-wind being generally checked, only a day or two about the full or change of the moon. As these western breezes on this coast take their rise from the same cause as the diurnal land breeze in warm climates, they may be considered as land-breezes of two or three days continuance, and forming an intermediate step between the land-breezes and monsoons. Although the influence of these breezes is felt farther off at sea than the common diurnal breeze, yet they do not extend a great way, being seldom felt above twenty or thirty or forty leagues from shore; and about C. La Vela, which is much exposed to the easterly wind, these breezes extend beyond eight or ten leagues from shore. Land breezes of the same nature, and proceeding from similar causes, are also experienced in the winter season in the bay of Campeachy which are there known by the name of Susamajenta winds. Beyond C. la Vela these western breezes are not felt, which is undoubtedly occasioned by the whole of that coast as far as C. St Augufine being so much exposed to the general trade-wind, which here sweeps along the coast with so much violence as almost totally to repel the weaker influence of the breezes. But between C. St Augufine and St Catharine's island, or a little farther, we again meet with a variation of the wind at different seasons, as it is here observed to blow in an E or NE direction from September till April; and from April till September from the SW. This variable wind, or monsoon, like the others on this coast, extends but for a very short way from shore, and is evidently occasioned by the same causes as the other periodical winds. For, in the summer-months, (which in this climate is between September and April, the land of the continent being heated by the sun, draws the trade-wind from its common course of SE, a little to the westward; and as the coast here tends towards the SW, the wind in some measure (as it always does) follows the same direction, and produces this ENE monsoon. But, in the winter, when this region becomes more cool, the easterly wind is repelled by the dense cold air from the mountains; by which means it is bent to the northward, and is forced along the coast to C. St Augufine; where meeting with no further hindrance, it again falls in with the general trade-wind, and is carried along with it in its proper direction.

We have purposely omitted mentioning the winds on the west coasts of Africa and America, till the others were explained, as the causes of the peculiarities here observed will be now more easily comprehended. On the coasts of Chili and Peru, in America, from 25° or 30° of south latitude to the line; and on the parallel coasts of Angola, &c. in Africa, the wind blows all the year from the south, varying in its direction a little in different places according to the direction of the coast, towards which it always inclines a little. But whatever is the direction at any one place, it continues the same throughout the whole year without
any variation, and always blows from some westerly point. But there is this difference between this wind upon the coasts of Chili and Angola, that it extends much farther out to sea upon the former than upon the latter.

In order to explain the cause of this singular phenomenon, it is necessary to recollect, that the general trade-wind is produced by the concurrence of two separate causes. One is the great heat of the equatorial region, by which alone would be produced a constant north or south wind. The other is the diurnal revolution of the earth, which would cause a perpetual tendency of the air in those warm regions from east to west. From the concurrence of these two causes result the general trade-wind, which would constantly blow from the SE or NE, as we have already demonstrated. But if any one of these two causes, in any particular place, is prevented from producing its full effect, while the other continues to exert its influence, the general direction of the wind will be varied, and it will assume another. Thus, if the east wind was prevented from acting in any particular place, while nothing interrupted the south or north wind, it is evident that the air would rush towards the equator in that direction which was nearest and easest, whether that should be pointing eastward or westward.

Now as the high mountains in the internal parts of Africa and America interrupt the course of the east wind near the surface of the earth, while these coasts of which we now treat are entirely open to the south, the wind naturally rushes along the coasts of Chili and Angola from north to south; and as the low lands near the shore, in those warm regions, is generally warmer than the sea, the wind will naturally point in towards the shore, as is generally observed to happen.

This, then, is the obvious cause of the south wind which always prevails upon the coasts of Chili and Peru, as well as along the shores of Angola, Leango, &c. But it is only near the shore that this can take place; nor can it extend to a great height above these low and fertile regions. For as the internal parts of these countries are exceedingly high; but more especially the Andes of America, which experience a perpetual degree of cold more intense than some polar regions ever experience; the air muri here be condensed to a very great degree, and send forth from these high regions a perpetual wind to every side, which occasions almost all the peculiarities that have been remarked in these climates: For by opposing the general current of the trade-wind upon the eastern part of these countries, they produce these deluges of rain which supply the immense rivers of the Amazon, La Plata, &c. thee do not, like the Nile and Gambia, swell only at a particular season, and then shrink into a diminutive size again, but continue throughout the whole year, with less variation of size, to pour their immense floods of water into the ocean. These cold winds likewise stretching to the westward, at a considerable distance above the warmer regions of the sea-coast, at length descend as low as the ocean, and form the general trade-wind, and occasion that unusual degree of cold which navigators have so often complained of even under the line to the westward of America. To the same cause also must we attribute the thick fogs so common upon the southern parts of Chili and along the coasts of Peru, with the other peculiarities of that singular climate about Lima and the kingdom of Valparaiso in South America; for the vapours which are exhaled in such great abundance in the warm regions on the

feashore, are, at a little height above the earth, condensed by the cold winds which come from the mountains, and form these thick mists which are so often observed in this climate. The same effects are felt in some degree on the similar coast of Africa. But as the mountains of Africa are not so high as the Andes of America, nor approach to near the western coast, the effects are less sensible here than in America. The great height of the Andes above the mountains of the similarly situated country of Africa, is the only reason why the effects on that coast are not felt to an equal degree, although similar in kind.

A more singular deviation from the general trade-wind is observed to take place on the African and American coasts to the north of the line, than those we have taken notice of to the south of it. For it is observed, that from California to the bay of Panama, all along the coasts of New Spain, the winds blow almost constantly from the west or SW, nearly directly opposite to the trade-wind; and on the coast of Africa from C. Bayador to C. Verde, they blow chiefly from the NW, standing in upon the shore; from thence the wind beads gradually more and more from the north to the west, and so round to the SW, all along the coast of Guinea, as will be distinctly seen by the map. After what we have said of the winds on the southern parts of those regions, it will be unnecessary to spend much time in explaining the cause of these peculiarities, as it will evidently appear that they are nearly the same, the variations here observed being occasioned by the particular direction of the coast. Thus, along the coast of New Spain, the wind blows nearly the same direction in every place, as there are no remarkable bendings on the coast; being uniformly drawn towards the shore, by the great heat of the low part of the continent near the sea; which in these regions is always more heated than the water of the ocean, and occasions that inflection. But as the coast of Africa is more irregular, the winds also are found to be more different in their direction. To the north of C. Verde, as the coast stretches nearly south and north, the wind, being drawn towards it a little, blows from the NW. But beyond that, the coast bends more eastward to C. Panama; from which it runs E or NE all along the coast of Guinea, the wind shifting gradually more and more to the west, still pointing in upon the coast. And as there is nothing to oppose the current of air, which comes from the south, along the coast of Angola, it stretches forward till it comes within the influence of the coast of Guinea, and is there drawn in towards the shore in a SW direction. But as it is only the lower regions of the coast of Guinea, which are so much warmed, the high mountains within continuing cold; the northerly wind coming from these meeting and opposing the southerly winds in the higher regions of the air, by their mutual conflicts occasion those incessant rains and tremendous thunder so remarkable along the whole of this uncomfortable coast.

It has been often observed by mariners, that there is a track of fea to the west of Guinea from five to ten degrees of north latitude, in which the trade-wind blows with less headiness than in any other part of that ocean, being almost constantly troubled with calms and tornadoes; the cause of which the reader will perceive by inspecting the map; as he will easily see that the winds are drawn from this quarter almost in every direction; so that there can be here no constant wind; but being exhausted of its air, it must become lighter than the circumjacent parts, and must then be expul-
plied from either side, as chance or occasional circumstances may direct, which occasions those sudden gales and typhoons here observed.

Before we take our leave of this subject, it is necessary to observe, that in the Bay of Panama, the winds between September and March are easterly; but from March till September they blow chiefly from the SSW; that is, during the winter months, while the sun is far from them, the winds are off shore, and during the summer months, the land being heated to a considerable degree, they are drawn towards the shore as usual. It is remarkable, however, that this is the only part on the east of a large continent where the wind shifts regularly at different seasons; which seems to be occasioned by the great height of the Isthmus of Darien, and the Terra Firna to the east of it, and the nearest of these to the sea, in comparison of the mountains near Benin on the similarly situated coast of Africa; which is greatly afflicted by the deepens of the bay, which, by bending too much to the eastward from C. Lorenzo, is in a great measure screened from the force of the former winds, which allows the winter breeze to extend itself upon the bay with more facility. We ought here also to remark, that along the coast of Mexico, between C. Pelanço and Guatimala, there are land winds which blow in the months of May, June, and July, called by the Spaniards Popogatzois. They greatly resemble the Summamontio winds in the Bay of Campeachy, as they blow both night and day a moderate breeze without intermission, sometimes three or four days or a week together. But as these blow from the land in summer only, whereas the Summamontio's blow only in winter, they must be occasioned by a different cause; which seems to be this: As the continent which divides the south sea from the Bay of Mexico and Gulf of Honduras, is but of very small breadth, and in many places very high ground, the heat which it receives from the sun in summer is not so great as on the similar coast of Africa; and as the trade-wind coming from the great Atlantic ocean sweeps along the eastern part of the American coast from C. St. Augufine to the Bay of Honduras with very great violence at that season, the small heat of this narrow continent, is not sufficient to stop it entirely during that season; so that at some times it blows for a short time quite across it, and occasions those winds called Popogatzois.

Besides these more general winds, there are likewise some particular winds which are only felt in particular places at certain times, whose effects are so singular as to merit attention; some of which we shall here take notice of. In the Gulf of Persia, particularly at Ormuz, during the months of June and July, there sometimes blows from the west, for a day or two together, a hot suffocating fiery wind, which scorcheth up and destroyeth any animal that may be exposed to it; for which reason, almost every body leave their habitations at Ormuz during these two months, and retire to the mountains near Ubirah in Persia, where they enjoy a more comfortable climate. To explain the cause of which, it is necessary to observe, that along all the coasts of Asia, to the north of the Indian ocean, the diurnal sea and land breezes take place, as in every part of the torrid zone, by means of which the monsoons are not felt close in upon the shores. But as the monsoon continues to blow regularly at a small distance from shore, so in all probability it continues its course without interruption at a small distance above the surface of the earth. Now when the monsoon is in its greatest vigour, its influence will sometimes de

execute even as low as the surface of the earth, and, interrupting the course of the breezes, hurry along with it these warm vapours, which ought to have ascended upwards, and produced the fatal sea-breeze; and as the earth is thus deprived of the refreshing influence and moisture of the sea-breeze, the air, by the strong reverberation of the sun's beams from such dry and sandy countries as Arabia, must soon be heated to an amazing degree, and produce these hot and suffocating winds. It is also remarkable, that these hot winds are more often experienced near headlands, where the sea-breezes are weakest, which seems to confirm this hypothesis. Winds similar to these in kind, though not in degree, are felt upon the coast of Coromandel during the months of June, July, and August, while the west monsoon reigns; and on the Malabar coast they are likewise felt in the months of December and January, while the east monsoon reigns; but these are much less powerful than either of the others. As these hot winds always come from the land, they are known upon these coasts by the name of Tornado's.

It has likewise been observed, that on the coast of Africa to the north of C. Verde, during the months of December, January, and February, there sometimes blows, for a day or two together, an easterly wind, so very intensely cold as to be almost as destructive as the warm winds at Ormuz. We have already in some measure explained the cause of this phenomenon. During these months, when the sun is far from them, his influence is less felt than at other seasons, and the northerly wind upon the coast is of course weakened. Infomuch that the cold produced by the mountains in the heart of the country being now in its greatest degree of force, bursts its usual confinement for a time, spreading to the west with great violence, and producing those uncommon effects already mentioned. Those who fail on these coasts, distinguish this particular wind by the name of Hermatan.

There are the principal winds, whether constant or periodical, that take place within the tropics; and thus simple are their causes.

The succession of sea and land breezes renders the Torrid Zone not only habitable but comfortable. Besides, as these currents of cold air, rushing from each side of the globe, and carrying along with them vast quantities of aqueous vapours which they collect from the surface of the earth in their course, meet and oppose one another at that part of the atmosphere where the influence of the sun is greatest at the time, the water is there forced from the clouds in such prodigious quantities, as to produce a diversity of feasons in the Torrid Zone, something similar to what is experienced in more temperate climates; with this difference however, that whereas, in temperate climates, the warmest and most comfortable season is when the sun approaches nearest perpendicular to them, in these warmer climates the heavy rains which fall upon them at that season moderate the heat, and prevents the sun from having such an effect as at other times; so that their coldest and most inconstant weather, which they call winter, is at that season, when without this cause, they would be exposed to the sun's most powerful influence.

We shall only take notice of one other instance of the happy effects produced on our globe, by the laws of nature with respect to winds. We have seen, that in the great Atlantic and Pacific oceans, the trade-wind blows constantly from the easterly points throughout the whole year, so that
nature are concerned we find, that what produceth the death, at the same time furnisheth a remedy: for that very same ships fail from east to west within the tropics with the utmost facility; but it is absolutely impossible in these seas to fail from west to east, as the wind would be constantly against them; so that ships bound for any part to the eastward in these regions, must hard to the north or south till they are beyond the limits of the trade-winds, where they meet with variable breezes, by the help of which they fail to the eastward. But if the same constant trade-wind had taken place in the northern part of the Indian Ocean, it would have been impossible to have failed to the eastward at all; because the continent of Asia would have prevented the ships from failing far enough north to find the variable winds. But here, as in almost every case in which the operations of nature are concerned, we find, that what produces the difficulty, at the same time furnishes a remedy: for that very same winds which separate it from Bessarabia and Moldavia, on the south-west; and by the province of Red-Russia, on the north and north-east; by Tartary, on the south-east, by the river Nieffer, where it receives the Doria; then passing north-east, it discharges itself by several channels into the gulf of Venice. Thus we see, that where-ever the sea is open to the south or north, near the tropics, so as that ships are at liberty to reach the variable winds, the trade-wind constantly blows in one direction; but where-ever there is any extent of continent within the verge of the Torrid Zone, so as that they could not be at liberty to reach the variable winds, there the course of the trade-wind is altered, being drawn towards it in summer, and from it in winter, forming that shifting wind called monsoons. From which we may naturally infer, that as there are no monsoons in the Pacific or Atlantic, or in the western part of the Indian ocean, to the south of the line, there are no extensive continents near the tropics in either of these places.

POE

PNEUMATOCELE. See Medicine and Surgery.

PNEUMONICS, in pharmacy, medicines proper in diseases of the lungs, in which respiration is affected.

PO, a great river of Italy, rising in the Alps, and running westward. But if the same constant trade-wind had taken place in the northern part of the Indian Ocean, it would have been impossible to have failed to the eastward at all; because the continent of Asia would have prevented the ships from failing far enough north to find the variable winds. But here, as in almost every case in which the operations of nature are concerned, we find, that what produces the difficulty, at the same time furnishes a remedy: for that very same winds which separate it from Bessarabia and Moldavia, on the south-west; and by the province of Red-Russia, on the north and north-east; by Tartary, on the south-east, by the river Nieffer, where it receives the Doria; then passing north-east, it discharges itself by several channels into the gulf of Venice. Thus we see, that where-ever the sea is open to the south or north, near the tropics, so as that ships are at liberty to reach the variable winds, the trade-wind constantly blows in one direction; but where-ever there is any extent of continent within the verge of the Torrid Zone, so as that they could not be at liberty to reach the variable winds, there the course of the trade-wind is altered, being drawn towards it in summer, and from it in winter, forming that shifting wind called monsoons. From which we may naturally infer, that as there are no monsoons in the Pacific or Atlantic, or in the western part of the Indian ocean, to the south of the line, there are no extensive continents near the tropics in either of these places.

POE

Voillis thinks that love was the first occasion of poetry; which is not improbable, considering that this affection is coeval with mankind, is universal, and naturally productive of poetry. Yet it undoubtedly owes its increase and progress to religion. Dacier indeed calls it the offspring of religion; and it is certain, in the earliest ages of the world, that it was usual to sing hymns to the honour of the gods upon solemn festivals. Du Bos thinks that poetry has been employed in all ages, even by the most unpollished nations, to preserve the memory of past events. Its principal aim is to flatter our senses and imagination: for, according to Plato, it awakes the spiritual empire of the soul. Every kind of poetry charms us in proportion to its object, says Du Bos; and to be very affecting, it ought to be very exact. It is not the same with poetry as with other arts; for an ignorant person may judge of poetry by the impression it makes on him: whence all men have a right to give their opinion concerning a piece of poetry; and this judgment ought to be founded on experience rather than on argumentation. Poetry is an art where every thing should please. It is not enough to exhibit nature, which in certain places and circumstances is rude and unpleasant; but the poet must chuse in her what is beautiful from what is not: whence a poet ought to chuse, for the subject of his imitation, something that is naturally affecting. There is a particular rhetoric for poetry, which consists in discerning very precisely what ought to be said figuratively, and what to be spoken simply; and in knowing where ornament is required, and where not: yet the style should be copious, and every species of writing in this art should have a distinction proper to itself. The qualifications, then, necessary for poetry, or those which form a good poet, are seldom found united in one person: he must have an extraordinary genius, great natural gifts, a wit just, piercing, solid, and universal; an understanding clear and distinct; an imagination neat and pleasing; an elevation of soul that depends not on art, or study, and which is purely a gift of heaven, and must be sustained by a lively fancy and vivacity, a great judgment to consider wisely of things, and a vivacity to express them with that grace and abundance which gives them beauty. In fine, to accomplish a poet, is required a temperature of wit and fancy, of strength and sweetness, of penetration and delicacy; but above all,
POLIANTHES, in botany, a genus of the hexandria monogynia class. The corolla is bell-shaped; and the stigma is trifid; and the capsule has three cells. There are three species, all natives of India.

POLE, in astronomy, one of the extremities of the axis on which the sphere revolves. There are principal points in an ecuetteon, as represented in Plate CXLV. fig. 2. where A shows the dexter chief; B, the precise middle chief; C, the sinister chief; D, the honour-point; E, the fels-point, called also the centre; F, the nombril-point, that is, the navel-point; G, the dexter base; I, the sinister base; H, the precise middle base.

POLE, or Polar star, is a star of the second magnitude, containing sixteen feet and a half. It is one hundred and fifty miles long, and seventy broad.

POLCIECK, the capital of the palatinate of the same name, in the duchy of Lithuania, in Poland: E. long. 29°, N. lat. 56° 20'.

POLICY, or Polity, in matters of government. See Polity.

POLIGNAC, in botany. See Carduus.

POLYANDRIA, in botany. See Botany, p. 635.

POLYANTHA, in botany. See Primula.

POLEX, in anatomy, denotes either the thumb or great toe, according as either manus or pedis is added to it. See Anatomy.

POLLY, a word used in ancient writings for the head: hence to poll, is either to vote or to enter down the names of those persons who give in their votes at an election.

POLLOCK, in ichthyology. See Gadus.

POLLY, or Polity, denotes the peculiar form and constitution of the government of any state or nation; or, the laws, orders, and regulations, relating thereto.

POLYCHREST, in pharmacy, signifies a medicine that serves for many uses, or that cures many diseases.

POLYCHREST, in pharmacy, a compound salt made of equal parts of salt-mercur and sulphur, laid on a red-hot crucible.

POLYCHREST, or POLYCHREST, a compound salt made of equal parts of salt-mercur and sulphur, laid on a red-hot crucible.

POLYCHREST, or Polyiemum, in botany, a genus of the diadelphia diandria monogynia class. The calix consists of five petals, and it has but one round seed. There is but one species, a native of Germany.

POLYCHREST, in botany, a genus of the triandria monogynia clasfs. The calix consists of three leaves, and the corolla of five petals; and it has but one round seed. There is but one species, a native of Britain.

POLYCYTIA, in botany. See Botany, p. 635.

POLYGANY, a plurality of wives or husbands, in the possession of one man or woman, at the same time.

POLYGAMY, a plurality of wives or husbands, in the possession of one man or woman, at the same time. Many arguments have been offered to prove the unlawfulness of polygamy; one of the principal of which is, that the males and females brought into the world are nearly on a balance; only abating for a small excess on the side of the males to make up for the extraordinary expense thereof in war and at sea: whence it evidently follows, that nature only intends one wife, or one husband, for the same person; since if they have more, some must go without any at all. Hence it is justly concluded, that
that the Christian law, which prohibits polygamy, is more
agreeable to the law of nature than the Mahometan, and,
we may add, than the Jewish law, by which polygamy
was tolerated.

POLYGLOTT, among divines and critics, chiefly denotes
a bible printed in several languages. See Bible.

POLYGON, in geometry, a figure with many sides, or
whose perimeter consists of more than four sides at least:
such are the pentagon, hexagon, heptagon, &c.

POLYGONATUM, in botany, See Contallaria.

POLYGONUM, in botany, a genus of the extandria tri-
gynia classis. It has no calyx; the corolla has five seg-
ments; and there is but one angular feed. The species
are 27, eleven of them natives of Britain.

POLYGYMIA, among botanists, See Botany, p. 635.

POLYHEDRON, in geometry, denotes a body or solid
comprehended under many sides or planes.

POLYHEDRON, in optics, is a multiplying glass or lens,
confifting of several plane surfaces disposed into a convex
form. See Optics.

POLYMATHY, denotes the knowledge of many arts and
sciences.

POLYMIA, in botany, a genus of the syngenia po-
gamia necessaria classis. The receptacle is paleaceous; it
has no pappus; and the calyx consists of ten leaves. There
are two species, both natives of America.

POLYPUS, in zoology, a species of the hydra, which,
although cut in a thousand pieces, and in every direction,
still exists, and each section becomes a complete animal.

POLYETALOUS, among botanists, an epithet applied
to such flowers as consist of several petals, or flower-leaves.

POLYPODIUM, in botany, a genus belonging to the cryp-
togamia filices classis. The fructifications are disposed in
round spots on the margin of the leaf. There are 65
species, 14 of them natives of Britain.

POLYPREMUM, in botany, a genus of the tetrandria mon-
gynia classis. The calyx consists of four leaves, and
the corolla, which is rotated, of four segments; the cap-

dule is compressed, and bilocular.

POLYPUS of the heart. See Medicine, p. 158.

POLYSYLLABLE, in grammar, a word consisting of more
yllables than three; for when a word consists of one,
two, or three syllables, it is called a monosyllable, dif-
yllable, and trisyllable.

POLYTEISM, in matters of religion, the doctrine or
belief of a plurality of gods.

POLYTRICHUM, in botany, a genus of the muci clasis.
The anthera is operculated, and the ca-

POLYTRICHUM, in botany, a genus of the cryptogamia
muci classis. The anthera is operculated, and the calyp-
ttra hairy. There are three species, one of them, viz.
the commune, or great golden maidenhair, a native of
Britain.

POMEGRANATE. See Punica.

POMMERANIA, a province of Upper Saxony, in the north
of Germany, bounded by the Baltic-see, on the north; by
Poland, on the east; by another part of Poland, and
Brandenburg, on the south; and by the dutch of Meck-
lenburg, on the west.

POMME, or Pommette, in heraldry, is a croix with
one or more balls or knobs at each of the ends.

POMMEL, or Pummel, in the menage, a piece of bract,
or other matter, at the top and in the middle of the fad-
dle-bow.

POND-WEED, in botany. See Potamogeton.
ware, is, that it is a half vitrified substance, or manufacture, in a middle state between the common baked earthen ware of our vulgar manufactures, and true glafs. This is the essential and distinctive character of porcelain; and it is only by considering it in this light, that we are to hope of arriving at the perfect art of imitating it in Europe. This attempt is to be made on these principles in two different manners. The one by finding some appropriated matter, on which fire acts with more than ordinary strength, in the time of its passing from the common baked state of earthen ware into that of glafs. The other is to compose a paste of two substances, reduced to a powder; the one of which shall be of force to refult a very violent fire, so as not to become vitrified in it; and the other a matter very easily vitrifiable. In the first case, the matter is to be taken out of the fire at the time when it is imperfectly vitrified; and in the other, the compound mass is to remain in the furnace, till the one substance which is the more easily vitrifiable is truly vitrified; and being then taken out, the whole will be what porcelain is, a substance in part vitrified, but not wholly so. The first method is that by which the European porcelain has been generally made, which though it may be very beautiful, yet it is always easy to distinguish even the line of it from the china-ware; and the nature of the two substances appears evidently different: these owing all their beauty to their near approach to vitrification, are made to endure a long and violent fire, and are taken from it at a time when a little longer continuance should have made them perfect glass; on the contrary, the china-ware being made of a paste, part of which is made of a substance in itself scarce possible to be vitrified, bears the fire in a yet more intense degree than ours, and is in no danger of running wholly into glafs from it.

The two substances used by the Chineses, are well known by the names of petunfe and kaolin; and on examining these, it appears very evident, that we have in Europe the very same substances, or at least substances of the very same nature, capable of being wrought into porcelain equally beautiful and fine.

Porcelain-shell. See Cypræa.

Porcupine, in zoology. See Histrix.

Pore, in anatomy, a little interstice or space between the parts of the skin, serving for perspiration.

Porella, in botany, a genus of mosses, the anthera of which is multilocular and foraminose. See Moss.

Poria, a genus of funguses, growing horizontally; but having its under side not formed into lamelle, but full of little holes or pores.

There are a great many species of poria, among which is the agaric of the shops. See Agaric, and Stypitic.

Porpesse, in ichthyology. See Delphinus.

Porphyry, in natural history, a kind of stone of a plain uniform grey, spotted with separate concrections, of great hardness, giving fire with fleel, not fermenting with acids, and very fluidly and difficultly calcining in a strong fire.

Porphyry is of several sorts; as, 1. The porphyry of the ancients, which is a most elegant mass of an extremely firm and compact structure, remarkably heavy, and of a fine strong purple, variegated more or less with pale, red, and white: its purple is of all degrees, from the cla-

Ret-colour to that of the violet; and its variegations are rarely disposed in veins, but spots, sometimes very small, and at others running into large blotches. It is less fine than many of the ordinary marbles; but it excels them all in hardness, and is capable of a most elegant polish. It is still found in immense llrata in Egypt. 2. The hard red lead-coloured porphyry, variegated with black, white, and green. This is a most beautiful and valuable substance. It has the hardnes, and all the other characters of the oriental porphyry; and even greatly excels it in brightness, and in the beauty and variegation of its colours. It is found in great plenty in the island of Minorca; and is extremely worth importing, for it is greatly superior to all the Italian marbles. 3. The hard pale-red porphyry, variegated with black, white, and green. This is of a pale flesh-colour; often approaching to white. It is variegated in blotches from half an inch to an inch broad. It takes a high polish, and emulates all the qualities of the oriental porphyry. It is found in immense llrata in Arabia Petraea, and in the Upper Egypt: and in separate nodules in Germany, England, and Ireland.

Porphyry-shell. See Murex.

Porrum, in botany. See Allium.

Port royal, the name of two monasteries of Cistercian nuns, in the diocese of Paris; the one near Chevreufe, and the other in Paris, in the suburbs of St James.

The nuns of the former of these monasteries, proving refractory, were dispersed; when many ecclesiastics, and others who were of the same sentiments as thefe religious, retired to Port Royal, took apartments there, and printed many books: hence the name of Port-Royalists was given to all of their party, and their books were called books of Port-Royal: from hence we say the writers of Port Royal, Mifsieurs de Port Royal, and the transla-

Port royal, in geography, a port-town, situated at the mouth of the river Blavet: W. long. 3° 15', N. lat. 47° 42'.

Port-louis, a port-town of Britain in France, situated in the bay of Bicay: W. long. 3° 6', N. lat. 47° 42'.

Port-mahon, a port-town of the island of Minorca, situated on a fine bay at the east end of the island, in E. long. 4° 6', N. lat. 39° 50'.

Port-royal, the name of two monasteries of Cistercian nuns, in the diocese of Paris; the one near Chevreufe, at the distance of five leagues from Paris, called Port-Royal of the fields; and the other in Paris, in the subburbs of St James.

The nuns of the former of these monasteries, proving refractory, were dispersed; when many ecclesiastics, and others who were of the same sentiments as these religious, retired to Port Royal, took apartments there, and printed many books: hence the name of Port-Royalists was given to all of their party, and their books were called books of Port-Royal: from hence we say the writers of Port Royal, Mefsieurs de Port-Royal, and the transla-

Port-royal, in geography, a port-town, situated in the extremity of a long point of land, in the south-east part of the island of Jamaica: W. long. 77°, N. lat. 17° 30'.

Port-royal, an island on the coast of South-Carolina, which, with the neighbouring continent, forms one of the most commodious harbours in the British plantations: W. long. 80°, N. lat. 31° 45'.

Porta, or vena porta, in anatomy. See Anatomy, p. 244.

Portate, or a cross portate, in heraldry, a crofs which does not stand upright, as crofes generally do, but lies across the escutcheon in bend, as if it were carried
carried on a man's shoulders. See Plate CXLV. fig. 4.

PORTRETRU, a city of Switzerland, in the bishopric of Basle: E. long. 7°, N. lat. 47° 30'.

PORTER, a kind of malt-liquor, which differs from ale and pale-beer, in its being made with high-dried malt. See Brewing.

PORTICO, in architecture, a kind of gallery on the ground, supported by columns, where people walk under covert.

PORTLAND, a peninsula in Dorsetshire, situated in the English channel, ten miles south of Dorchester, famous for producing the best free-stone.

PORTSMOUTH, a borough and port town of Hampshire, situated on a fine bay of the English channel; it has one of the most secure, capacious, and best fortified harbours in England: W. long. 1° 6', N. lat. 50° 48'. It sends two members to parliament.

PORTUGAL, the most westerly kingdom in Europe; it is about three hundred miles long, and one hundred broad; and is situated between 7° and 16° of W. long. and between 37° and 42° of N. lat. being bounded by Spain on the north and east, and by the Atlantic ocean on the south and west. This country is neither so hot nor so fruitful as Spain; it however produces plenty of grapes, olives, oranges and lemons.

PORTUGALLICA TERRA, earth of Portugal, the name of a fine allringent bole, dug in great plenty in the northern parts of Portugal, and esteemed a remedy against poisons and venomous bites, and malignant fevers.

PORTULACA, in botany, a genus of the dodecandria monogynia class. The corolla consists of five petals, and the calyx of two-segments. There are six species, none of them natives of Britain.

POSE', in heraldry, denotes a lion, horse, or other beast standing still, with all his four feet on the ground.

POSITIVE, a term of relation, opposed to negative. It is also used in opposition to relative or arbitrary: thus we say, beauty is no positive thing, but depends on the different tastes of people.

POSITIVE DEGREE, in grammar, is the adjective in its simple signification, without any comparison. See Grammar.

POSSE COMITATUS, in law, signifies the power of the county, or the aid and assistance of all the knights, gentlemen, yeomen, labourers, servants, apprentices, &c. and all others within the county that are above the age of fifteen, except women, ecclesiastical persons, and such as are decrepit and infirm.

This posse comitatus is to be raised where a riot is committed, a posse comitatus kept upon a forcible entry, or any force of rescue used, contrary to the king’s writ, or in opposition to the execution of justice; and it is the duty of all sheriffs to assist justices of the peace in the suppression of riots, &c. and to raise the posse comitatus, or to charge any number of men for that purpose.

POSSESSION, in Scots law. See Law, Tit. viii. 11.

POSSESSIVE, in grammar, a term applied to pronouns which denote the enjoyment or possession of any thing either in particular or in common: as meus, mine; and tuus, thine.

POSSESSORY action, in Scots law. See Law, Tit. xxx. 18.

POSSIBILITY, in law, is defined to be any thing that is altogether uncertain, or what may or may not be.

POSSIBILITY also denotes a non-repugnance to existing, in any thing that does not any way exist.

POSSIBLE, is sometimes opposed to real existence; and is understood of a thing which, though it does not actually exist, yet may exist; as a new star.

POST, a courier or letter-carrier, or one who frequently changes horses, posted or placed on the road, for quick delivery. The word is also applied to the houses where such a person takes up and lays down his charge.

In England, posts were first established by act of parliament in the twelfth year of the reign of Charles II. which enabled the king to settle a post-office, and appoint a governor.

Penny Post, a post established for the benefit of London and the adjacent parts, by which any letter or parcel not exceeding sixteen ounces weight, is speedily conveyed to and from all parts within ten miles of London.

POSTDAM, or POTS DAM, a town of Germany in the marquisate of Brandenberg, ten miles south-west of Berlin.

POSTHUMOUS, a child born after the death of his father, or taken out of the body of a dead mother; from whence it is frequently applied to the works of an author not published till after his decease.

POSTING, among merchants, the putting an account forward from one book to another, particularly in the journal or waite-book to the ledger. See Book-keeping.

POSTLIMINIUM, among the Romans, the return of one who had gone to sojourn elsewhere, or had been banished or taken by an enemy to his own country and state.

POSTULATE, in mathematics, &c is described to be such an easy and self-evident supposition, as needs no explication or illustration to render it intelligible; as, that a right line may be drawn from one point to another.

POTAMOGETON, in botany, a genus of the tetrandria tetracyania class. It has no calix, nor flylus; but has four petals, and four seeds. There are 12 species, to of them natives of Britain.

POTANCE, in heraldry, a cross like that represented in Plate CXLV. fig. 4.
POT-ASH, the lixivious-ashes of certain vegetables, used in the making of glass, soap, &c.

The method of making pot-ash is directed by Dr. Shaw, as follows. Burn a quantity of billet-wood to grey allies; this lye be strained through a coarse linen cloth, to keep out any black parts of the half-burnt wood, that might happen to remain in the allies: then evaporate this strained lye in an iron-pan over a quick fire almost to driness; then taking out the matter remaining at the bottom, and putting it into an iron-crucible, let it in a strong fire till the matter is melted, and then immediately pour it out upon an iron-plate, where it soon cools, and appears in the form of a solid lump of pot-ash. Much after this manner is pot-ash made in the large way of business, for the service of the soap-boiler; glass-maker, fuller, &c. but according to the difference of the wood or combustible matter employed, with the manner of turning it, and conducting the procures, different kinds of pot-ash are prepared.

POTATOES, in botany. See Convolvulus, of which it is a species.

POTENT, or Potence, in heraldry, a term for a kind of crutch. It is otherwise called the Jerusalem crufs, and is represented in Plate CXLV. fig. 5.

POTENTIA, Power, that whereby a thing is capable either of acting, or being acted upon.

POTENTIAL, in the schools, is used to denote and distinguish a kind of qualities, which are supposed to exist in the body in potentia only, by which they are capable in some manner of affecting and impressing on us the ideas of such qualities, though not actually inherent in themselves; in which fenie we say, potential heat, potential cold.

POTENTIAL, in medicine. Cauteries are distinguished into actual and potential. See CAUTERY.

POTENTIAL, in grammar, an epithet applied to one of the moods of verbs. The potential is the same in form with the subjunctive. See GRAMMAR.

POTENTILLA, in botany, a genus of the icofandria polygaenia class. The calix consists of five segments, and the corolla of five petals; the seeds are round, naked, and fixed to the receptacle. There are 27 species, 8 of them natives of Britain.

This plant is said to posses in a great measure the virtues of the peruvian bark.

POTERIUM, in botany, a genus of the monoecea polyandria class. The calyx of the male consists of five segments, that of the male has but one entire rough leaf. Neither of them have any corolla; the stamens of the male are from five to ten; and the hypan of the female are from two to five; and the seed is single and oval. There are three species, one of which, viz. the fanguiforba, or burnet, is a native of Britain.

POTHOS, in botany a genus of the gyandria polyandria class. The fpatha and fpatix are roundish; it has no calix; the corolla has four petals; and the berry contains many seeds. There are seven species, none of them natives of Britain.

POISON, a liquid medicine, consisting of as much as can be drank at one draught.

POTOSI, a city of Peru in South America, situate at the bottom of a mountain of that name, in which is the richest silver-mine ever discovered: W. long. 67°, S. lat. 29°.

POTTERY, the manufacture of earthen ware, or the art of making earthen vessels.

The wheel and lathe are the chief, and almost the only instruments used in pottery: the first for large works, and the last for small. The potter's wheel consists principally in the nut; which is a beam or axis, whose foot or pivot plays perpendicularly on the free-tome sole or bottom. From the four corners of this beam, which does not exceed two feet in height, arise four iron-bars, called the spokes of the wheel; which forming diagonal lines with the beam, descend, and are fastened at bottom to the edges of a strong wooden circle, four feet in diameter, perfectly like the felloes of a coach-wheel, except that it has neither axis nor radii, and is only joined to the beam which serves it as an axis by the iron-bars. The top of the nut is flat, of a circular figure, and a foot in diameter; and on this is laid the clay which is to be turned and fashioned. The wheel, thus disposed, is encompassed with four different pieces of wood fastened on a wooden frame. The hind-piece, which is that on which workman sits, is made a little inclining towards the wheel: on the side-pieces are placed the prepared earth: on the side-pieces he rests his feet; and these are made inclining, to give him more or less room. Having prepared the earth, the potter lays a round piece of it on the circular head of the nut; and sitting down turns the wheel with his feet, till it has got the proper velocity: then, wetting his hands with water, he presses his fist or his fingers-ends into the middle of the lump, and thus forms the cavity of the vessel, continuing to widen it from the middle; and thus turning the inside into form with one hand, while he proportion the outside with the other, the wheel constantly turn all the while, and he wetting his hands from time to time. When the vessel is too thick, he uses a flat piece of iron, somewhat sharp on the edge, to pare off what is redundant; and when it is finished, it is taken off from the circular head, by a wire passed underneath the vessel.

The potter's lathe is also a kind of wheel, but more simple and flight than the former. Its three chief members are an iron-beam or axis, three feet and a half high, and two feet and a half diameter, placed horizontally at the top of the beam, and serving to form the vessel upon; and another larger wooden wheel, all of a piece, three inches thick, and two or three feet broad, fastened to the fame beam at the bottom, and parallel to the horizon. The beam or axis turns by a pivot at the bottom in an iron-fland. The workman gives the motion to the lathe with his feet, by pulling the great wheel alternately with each foot, still giving it a greater or leffer degree of motion, as his work requires. They work with the lathe, with the same instruments, and after the fame manner as with the wheel. The mouldings are formed by holding a piece of wood or iron cut in the form of the moulding to the vessel, while the wheel is turning round; but the feet and handles are made by themselves, and set on with the hand; and if there be any sculpture in the work, it is usuallly done in wooden moulds, and stuck on piece by piece on the outside of the vessel.

POTTLE, an English measure containing two quarts.

POULTRY,
POULTRY, all kinds of domestic birds brought up in yards, as cocks, hens, capons, ducks, turkeys, &c.

POUND, a standing weight. See Money.

POUND also denotes a money of account; so called, because the ancient pound of silver weighed a pound troy. See Money.

POUNDAGE, a subsidy of 10d. in the pound granted to the crown on all goods and merchandise exported or imported; and if by aliens, one penny more.

POURRESTORE, in law, is a wrongfull inclosure, or encroachment upon another person's property.

POURSUIVANT, or Pursuivant, in heraldry, the lowest order of officers at arms.

The pursuivants are properly attendants on the heralds, when they marshal public ceremonies. Of these in England, there were formerly many, but at present there are only four, viz. blue mantle, rouge-cross, rouge dragon, and portcullise. In Scotland, there is only one king at arms, who is styled Lion; and has no less than six heralds, and as many pursuivants, and a great many messengers at arms, under him.

POURVEYANCE, or Purveyance, in law, the providing corn, fuel, victual, &c. for the king's household; and hence the officer who did so was termed pourveyor.

POWDER, in pharmacy, a dry medicine well broken, or reduced to a fine powder.

POWDER, in mechanics See Mechanics.

Power, in law, signifies, in general, a particular authority, and, when broken in upon, gives an action at law.

Power, in mechanics See Mechanics.

Power, in law, signifies, in general, a particular authority granted to any person to another to represent him, or act in his stead.

POWERS, in arithmetic and algebra, are nothing but the products arising from the continual multiplications of a number, or quantity, into itself. See Algebra, p. 81, and Arithmetic, p. 420.

POX, or small pox, in medicine. See Medicine, p. 75.

French: Pox See Medicine, p. 133.

PRACTICE, in arithmetic. See Arithmetic, p. 393.

PRACTICAL SANCTION, in the civil law, is defined by Hottonian to be a reascript, or answer of the sovereign, delivered by advice of his council, to some college, order, or body of people, upon consulting him on some case of their community: The like answer given to any particular person, is called simply reascript. The term practical sanction, is chiefly applied to a settlement of Charles VI. emperor of Germany, who, in the year 1722, having no sons, settled his hereditary dominions on his eldest daughter, the archduchess Maria Theresa which was confirmed by the diet of the empire, and guaranteed by Great Britain, France, the States general, and most of the powers in Europe.

PRACTICIO HEREDITATIS, in Scots law. See Law, Tit. xxvii. 33.

PRAGUE, the capital of Bohemia, situated on the river Molda, in E. long. 14° 20', N. lat. 50°. This is a strong fine city; and next to London, Paris, and Constantinople, the largest in Europe.

PRAMNION, in natural history, the name of a semi-pelucid gem.

This is a very singular stone, and of a very great con-

6 M
PREDESTINATION, in general, signifies a decree of God, whereby, from all eternity, he ordained such a concatenation of causes as must produce every event by a kind of necessity.

In this sense, the Turks are great predestinarians; and on this account are much more daring in battle, and willingly encounter greater dangers than they would otherwise do. See MAHOMETANISM.

Predestination, among Christians, is used, in a more limited sense, for a judgment or decree of God, whereby he has resolved, from all eternity, to save a certain number of persons, from thence called elect; so that the rest of mankind being left in a state of impotence, are said to be reprobated.

PREDICABLE, among logicians, denotes a general quality which may be predicated of or affected of several things; thus an animal is predicabie of mankind, beasts, birds, fishes, &c. See LOGIC.

PREDICAMENT, among logicians. See LOGIC.

PREDICATE, in logic, that part of a proposition which affirms or denies something of the subject. See LOGIC.

PREDICTION, in natural history, the action of birds dressing their feathers, to enable them to glide more readily through the air, &c.

For this purpose they have two peculiar glands on their neck, which secrete a viscid matter into a bag that is perforated, out of which the bird occasionally draws it with its bill.

PRE-EXISTENCE, the state of a thing actually in being before another.

PREFACE, something introductory to a book, to inform the reader of the design, method, &c. observed therein, and generally whatever is necessary to facilitate the understanding of a book.

PREFECT, in ancient Rome, one of the chief magistrates who governed in the absence of the kings, consuls, and emperors.

Prefect of the pretorium, the leader of the pretorian bands destined for the emperor's guards, confisting, according to Dion, of 10,000 men. This officer, according to Suetonius, was instituted by Augustus, and usually taken from among the knights.

PREGNANCY, the state of a woman who has conceived, or is with child. See MIDWIFERY.

PREJUDICE does not mean a judgment merely as prior to another in respect of time, but as being passed before the things were duly considered and fully understood. Hence prejudice is sometimes called anticipation, and a preconceived opinion.

PRESBYTER, in the primitive Christian church, an elder, and of the second order of ecclesiastics; the other two being bishops and deacons.

PRESBYTERIANS, protestants, so called from their maintaining that the government of the church appointed in the New Testament was by presbyters; that is, by ministers and ruling elders, associated for its government and discipline.

The presbyterians affirm, that there is no order in the church as established by Christ and his apostles superior to that of presbyters; that all ministers, being ambassadors of Christ, are equal by their commission; and that elder or presbyter, and bishop, are the same in name and office: for which they allege, Acts xx. 28, &c.

The only difference between them and the church of England, relates to discipline and church-government. Their highest assembly is a synod, which may be provincial, national, or ecumenical; and they allow of appeals from inferior to superior assemblies; according to Acts xx. 2, 6, 22, 23. The next assembly is composed of a number of ministers and elders, associated for governing the churches within certain bounds. This authority they found upon Acts xi. 30. Acts xv. 4, 6, &c. The lowest of their assemblies or presbyteries consists of the minister and elders of a congregation, who have power to cite before them any member, and to admonish, instruct, rebuke, and suspend him from the eucharist. They have also a deacon, whose office is to take care of the poor.

The ordination of their ministers is by prayer, laying on of hands, and imposition of the hands of the presbytery. This is now the discipline of the church of Scotland.

PRESCRIBED, in grammar. See Grammar.

PRESCRIPTION, in theology, foreknowledge, or the knowledge which God has of events before they come to pass.

PRESCRIPTION, in Scots. See Law, Tit. vi. 18.

PREPOSITION, in grammar. See Grammar.

PREPARE, in anatomy. See Anatomy, p. 274.

PREROGATIVE of the king, that power which the king hath, not only over other persons, but over the ordinary course of the common law, in right of his crown.

Such as, that he may pardon a person condemned to die, that the king's person is subject to no man's suit, his possessions cannot be taken from him by any violence, his goods are subject to no tribute, nor deductible, &c.

PRESAGE, in antiquity, denotes an augury, or sign of some future event; which was chiefly taken from the flight of birds, the entrails of victims, &c. See AUGURY, and AUSPICES.

PRESBURG, the capital of Hungary, a large city on the north side of the Danube; fifty miles east of Vienna: E. long. 17° 30', N lat. 49° 26'.

PRESBYTER, in the primitive Christian church, an elder, and of the second order of ecclesiastics; the other two being bishops and deacons.

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PRESCRIBED, in grammar. See Grammar.

PRE:
PRESENTATION, in Scots law. See Law, Tit. v. 7.
PRESS, in the mechanic arts, a machine of wood, or iron, serving to squeeze any body very close, generally by means of a screw. See Mechanics.
PRESTER JOHN, or Jean, an appellation given to the king of Abyssinia or Ethiopia.
PRESTON, a borough-town, twenty miles south of Lancaster, which sends two members to parliament.
PRESS, in the mechanic arts, a machine of wood, or iron, serving to squeeze any body very close, generally by means of a screw. See Mechanics.
PRETEXTO, in the Italian music, intimates to perform very quick, as prestissimo does extremely so.
PRETEXT, a colour or motive, whether real or feigned, for doing something.
Toga PRETEXTA, among the ancient Romans, a long white gown, with a border of purple round the edges, and worn by children of quality till the age of puberty, vix. by the boys till seventeen, when they changed it for the toga virilis; and by the girls till marriage.
PRETOR, a magistrate among the ancient Romans, not unlike our lord chief justices, or lord chancellor, or both in one: as being vested with the power of distributing justice among the citizens. At first there was only one prætor; but afterwards another being created, the first or chief one had the title of prætor urbanus, or the city-prætor; the other was called peregrinus, as being judge in all matters relating to foreigners. But, besides these, there were afterwards created many provincial prætori; who were not only judges, but also shifted the confuls in the government of the provinces, and even were invested with the government of provinces themselves.
PRETORIAN GUARDS, in Roman antiquity, were the emperor’s guards, who at length were increased to ten thousand: they had this denomination, according to some, from their being stationed at a place in the palace called prætorium: their commander was called præfectus prætorii. See Prefect.
PRETORIUM, among the Romans, denoted the hall, or court wherein the prætor lived, and wherein he administered justice.
PREVENTION in Jurisdiction, in Scots law. See Law, Tit. ii. 5.
PRIAPISM, in medicine, a continual and painful erection of the penis.
PRIAPUS, in medicine, denotes the genital parts in men. It also denotes in antiquity, a fabulous deity, particularly adored at Lampacus, the place of his birth, who was revered very much for the extraordinary size of his parts.
PRIEST, a person set apart for the performing of sacrifice and other offices of religion.
PRIEST, in the Christian church, is a person invested with holy orders: in virtue whereof he has a power to preach, pray, administer the sacraments, &c.
PRIMA VERIS, among physicians, denote the whole alimentary duct; including the oesophagus, stomach, and intestines, with their appendages.
PRIMAGE, in commerce, a small duty at the water side, usually about twelve pence per ton, or six pence a bale, due to the master and mariners of a ship.
PRIMATE, in church polity, an archbishop, who is invested with a jurisdiction over other bishops.
PRIME, an appellation given to whatever is first in order, degree, or dignity, among several things of the same or like kind; thus we say the prime minister, prime coat, &c.
PRIMIPILUS, in antiquity, the centurion of the first cohort of a legion, who had charge of the Roman eagle.
PRIMITVAE, the first fruits gathered of the earth, whereof the ancients made presents to the gods.
PRIMITIVUS, in grammar, is a root or original word in a language, in contradistinction to derivative: thus, God is a primitive; godly a derivative, and god-like a compound.
PRIMULA, in botany, a genus of the pentandria monogynia class. The tube of the corolla is cylindrical, with an open mouth. There are eight species, three of them natives of Britain, viz. the vulgaris, or common primrose; the veris, or cows-lips; and the farinosa, or birds-eye.
PRINCIPAL, the chief and most necessary part of a thing.
PRINCIPATE, a province of the kingdom of Naples, situated on the Mediterranean, between the provinces of Lavoro and Calabria; and divided into the Hisber and Further Principate, with respect to the city of Naples.
PRINCIPLE, in general, is used for the cause, source, or origin of any thing.
PRINCIPES, is also sometimes used in a synonymous sense with axiom or maxim.
PRINOS, in botany, a genus of the hexandria monogynia class. The calix consists of six segments, and the corolla of one rotated petal; and the berry contains six seeds. There are two species, both natives of America.
PRINT, the impression taken from a copperplate. See Rolling-press Printing.
PRINTER, a person who composes and takes impressions from moveable characters ranged in order, or from plates engraved, by means of ink, and a press: or from blocks of wood cut in flowers, &c., and taken off in various colours on calicées, linens, silks, &c.

The most curious of these arts; and that which deserves the most particular explication, is the first; for to the printers of books are chiefly owing our deliverance from ignorance and error, the progress of learning, the revival of the sciences, and numerous improvements in arts, which, without this noble invention, would have been either lost to mankind, or confined to the knowledge of a few. The first printers were Gutenberg, Fütter, Scheffer, Mentel, and Koffer; and the first who practised this art in England was Fred Corelles, who brought it over from Haerlem, in the reign of king Henry VI. The great printers famous for the correctness and elegance of their works, were Aldus, and Paulus Manutius; the two Badi; William and Frederic Morel; Oporin; Frobenius; Robert, Henry, and Charles Stephens; Gryphius, Turnebus, Torres, Commelin, Plantin, Raphelengius, Vactofan, Bleau, Crifpin, and the two Elzevirs; and among these, the learned printers were the Manutii, the Stephens, the Bodii, Turnebus, Morel, &c. Plantin had the title of archigraphorus, or arch-printer, given him.
PRINTING, the art of taking impressions from characters or figures, moveable or immovable, on paper, linen, silk, &c. There are three kinds of printing; the one from moveable letters, for books; another from copper-plates, for pictures; and the last from blocks, in which the representation of birds, flowers, &c. are cut, for printing calicoes, linens, &c. The first called common-press printing, the second rolling-press printing, and the last calico, &c. printing. The principal difference between the three consists in this, that the first is cast in relief, in distinct pieces; the second engraved in creux; and the third cut in relief, and generally flamed, by placing the block upon the materials to be printed, and striking upon the back of it.

Progress of Printing. Who the first inventors of the European method of printing books were, in what city and what year it was set on foot, are questions long disputed among the learned. In effect, as the Grecian cities contended for the birth of Homer, so do the German cities for that of printing. Mentz, Haerlem, and Strafburg, are the warmest on this point of honour. John Guttenburg, and John Full of Mentz; John Mentel of Strafburg, and L. John Kofter of Haerlem; are the persons to whom this honour is severally ascribed, by their respective countrymen; and they have all their advocates among the learned. However, their first essays were made on wooden blocks, after the Chinese manner. The book at Haerlem, the vocabulary called Catholicon, and the pieces in the Bodleian library, and that of Bennet-college, are all performed in this way; and the impression appears to have been only given on one side of the leaves, after which the two blank sides were pasted together. But they soon found the inconveniences of this method; and therefore thought themselves of an improvement; which was by making single letters distinct from one another; and these being first done in wood, gave room for a second improvement, which was the making them of metal; and, in order to that, forming moulds, matrices, &c. for casting them.

From this ingenious contrivance we ought to date the origin of the present art of printing, contradistinguished from the method practised by the Chinese. And of this Schoffer, or Scheffer, first servant, and afterwards partner and son-in-law of Full, at Mentz, afo mentioned, is pretty generally allowed to be the inventor, so that he may properly be reckoned the first printer, and the Bible which was printed with moveable letters in 1450, the first printed book; the next was Auguiffine de civitate Dei, then Tully's offices, printed about the year 1461. In these books they left the places eof the initial letters blank, and gave them to the illuminers to have them ornamented and painted in gold and azure, in order to render the work more beautiful, and, as some think, to make their books pass for manuscripts.

Some authors tell us, that Full carrying a parcel of bibles with him to Paris, and offering them to sale as manuscripts; the French, upon considering the number of books, and their exact conformity to each other even to a point, and that it was impossible for the scribes to write to exact, concluded there was witchcraft in the cafe, and, by their actually indicting him as a conjurer, or threatening to do so, extorted from him the secret; and hence the origin of the popular story of Dr. Faulus.

From Mentz, the art of printing soon spread itself throughout a good part of Europe: Haerlem and Strafburg had it very early; which, as the current of authors represent it, occasioned their pretending to the honour of the invention. From Haerlem it passed to Rome in 1467; and into England in 1468, by means of Tho. Bouchier, archbishop of Canterbury, who lent W. Turner master of the robes, and W. Caxton merchant, to Haerlem to learn the art. These privately prevailing with Corfeilles, an under-workman, to come over, a press was set up at Oxford and an edition of Rufinus on the creed was printed the same year in octavo. From Oxford, Caxton brought it to London about the year 1470, and the same year it was carried to Paris. Hitherto there had been nothing printed but in Latin, and the vulgar tongues; and this first in Roman characters, then in Gothic, and at last in Italic: but in 1480, the Italians cast a set of Greek types; and they have also the honour of the first Hebrew editions, which were printed about the same time with the Greek.

Towards the end of the sixteenth century there appeared various editions of books in Syriac, Arabic, Persian, Armenian, Coptic or Egyptian characters; some to gratify the curiosity of the learned, and others for the use of the Christians of the Levant. Out of Europe, the art of printing has been carried into the three other parts of the world: for Asia, we fee impreffions of books at Goa, and in the Philippines; at Morocco, for Africa; at Mexico, Lima, Philadelphia, New York, Boston, &c. for America. The Turks, indeed, rigorously prohibit printing throughout their empire, as imagining that the too frequent communication with books might occasion some change in their religion and government; yet the Jews have several editions of their books printed at Jaffa, and even at Constantinople.

Method of Printing. The workmen employed in the art of printing are of two kinds: compositors, who range and dispose the letters into words, lines, pages, &c. according to the copy delivered them by the author; and pressmen, who apply ink upon the same, and take off the impression. The types being cast, the compositor distinguishes each kind by itself among the divisions of two wooden frames, an upper and an under one, called cafes; each of which is divided into little cells or boxes. Those of the upper cafe are in number ninety-eight; there are all of the same size; and in them are diposited the capitals, small capitals, accented letters, figures, &c. the capitals being placed in alphabetical order. In the cells of the lower cafe, which are fifty-four, are placed the small letters, with the points, spaces, &c. The boxes are here of different sizes, the larges being for the letters most used; and these boxes are not in alphabetical order, but the cells which contain the letter ofteneft wanted are nearest the compositor's hand. Each cafe is placed a little above, that the compositor may more easily reach the upper boxes. The instrument in which the letter are set is called a composing-flick, (ibid, n° 2) which commits
consists of a long and narrow plate of brass, or iron, &c.

To dress the chafe, or range and fix the pages therein, the compositor makes use of a fet of furniture, consisting of slips of wood of different dimensions, and about half an inch high, that they may be lower than the letters: some of these are placed at the top of the pages, and called head-flicks; others between them, to form the inner margin; others on the sides of the crofles, to form the outer margin, where the paper is to be doubled; and others in the form of wedges to the sides and bottom of the pages. Thus all the pages being placed at their proper distances, and secured from being injured by the chafe and furniture placed about them, they are all united, and fastened together by driving small pieces of wood called quoins, cut in the wedge-form, up between the flating side of the foot and side flicks and the chafe, by means of a piece of hard wood and a mallet; and all being thus bound fast together, so that none of the letters will fall out, it is ready to be committed to the the pressman.

Before the compositor proceeds to compose, he puts a rule, or thin flip of brass-plate, cut to the length of the line, and of the fame height as the letter, in the composing-flick, against the ledge, for the letter to bear against. Things thus prepared, the compositor having the copy lying before him, and his flick in his left-hand, his thumb being over the slider d; with the right, he takes up the letters, spaces, &c. one by one, and places them against the rule, while he supports them with his left thumb by prefling them to the end of the slider d. the other hand being conftantly employed in flitting in other letters: the whole being performed with a degree of expedition and address not eafy to be imagined.

A little being thus compos'd, if it end with a word or syllable, and exactly fill the measure, there needs no further care; otherwife, more spaces are to be put in, or else the distances leflened between the feveral words, in order to make the measure quite full, fo that every line may end even. The spaces here used are pieces of metal exactly shaped like the flakes of the letters: these are of various thicknefles, and serve to support the letters, and to prefler a proper distance between the words; but not reaching fo high as the letters, they myte no impression when the work is printed. The firft line being thus finifh'd, the compositor proceeds to the next; in order to which he moves the brass-rule from behind the former, and places it before it, and thus compofes another line againft it after the fame manner as before; going on thus till his flick is full, when he empties all the lines contained in it into the gally.

The compositor then fills and empties his composimg-flick as before, till a complete page be formed; when he ties it up with a cord or pack-thread, and letting it by, pro- ceeds to the next, till the number of pages to be contain- ed in a sheet is completed; which done, he carries them to the impofing-ftone, there to be ranged in order, and fastened together in a frame called a chafe, and this is termed impofing. The chafe is a reftangular iron-frame, of different dimensions, according to the size of the paper to be printed, having two crofle-pieces of the fame metal, called a long and short crofs, mortifed at each end fo as to be taken out occasionally. By the different situation of these crofles the chafe is fitted for different volumes: for quarto's and octavo's, one traverses the middle length- wise, the other broadwise, fo as to interfeft each other in the centre: for twelve's and twenty-fours, the short crofs is thifled nearer to one end of the chafe: for folios, the long crofs is left entirely out, and the short one left in the middle; and for broad-sides, both crofles are set aside.

As it is imposfible but that there mytle be fome mif- takes in the work, either through the oversight of the compositor, or by the casual tranfposition of letters in the cafes; a sheet is printed off, which is called a proof, and given to the corrector; who reading it over, and confuluming it by the copy, by making the alterations in the margin, it is delivered back to the compositor to be corrected.

The compositor then unlocking the form upon the cor- recting-ftone, by loofening the quoins or wedges which bound the letters together, rectifies the myfakes by picking out the faulty or wrong letters with a fender sharp-pointed steel-bodkin, and puts others into their places. After this another proof is made, fent to the author, and corrected as before; and laftly, there is another proof, called a re-vice, which is made in order to fee whether all the myfakes marked in the laft proof are corrected.

The preffman's businefs is to work off the forms thus prepared and corrected by the compositor; in doing which there are four things required: paper, ink, balls, and a preff. To prepare the paper for ufe, it is to be firft wetted by dipping several sheets together in water; these are afterwards laid in a heap over each other; and to make them take the water equally, they are all prefled clofe down with a weight at the top. The ink is made of oil and lamp-black; for the manner of preparing which, fee Printing Ink. The balls, by which the ink is applied on the forms, are a kind of wooden funnels with handles, the cavities of which are filled with wool or hair, as is also a piece of alum-leather or pelt nailed on the handle, the cavities of which are filled with wool or hair. The ink-block, daubs and works them together to diffuse the ink equally. To dress the compositor's hands, and applying one of them to the ink-block, daubs and works them together to distribute the ink equally, and then blackens the form which is placed on the preff, by beating with the balls upon the face of the letter. The printing-preff represented in Plate CXLVII. fig. 1.
The body consists of two strong checks, a, placed perpendicularly, and joined together by four cross-pieces; the cap b, the head c, which is moveable, being partly fastened by two iron-pins, or long bolts, that pass the cap; the shelves d, which serve to keep ready a part called the hoist; and the winter x, which bears the carriage, and sustains the effort of the press beneath. The spindle f is an upright piece of iron pointed with steel, having a male-crew which goes into the female one in the head about four inches. Through the eye g of this spindle is fastened the bar k, by which the pressman makes the impression. Part of the spindle is inclosed in a square wooden frame called the hoist b, and its point works into a brass pan supplied with oil, which is fixed to an iron plate let into the top of the platten. At each corner of the hoist, there is an iron-hook fastened with pack-thread to those at each end of the platten, in such a manner as to keep it perfectly level. The carriage l is placed a foot below the platten, having its fore-part supported by a prop called the fore-stay, while the other rests on the winter. On this carriage, which sustains the planks, are nailed two long iron-bars or ribs, and on the planks are nailed short pieces of iron or steel called cramp-irons, equally tempered with the ribs, and which slide upon them when the plank is turned in or out. Under the carriage is fixed a long piece of iron called the spit, with a double wheel in the middle, round which are fastened the planks; and to the outside of the spit is fixed a rounce m, or handle, to turn round the wheel. Upon the planks is a square frame or coffin, in which is inclosed a polished stone on which the form n is laid; at the end of the coffin are three frames, viz. the two tympan and ruffket; the tympan a are square, and made of three thick pieces of iron, equally tempered, and at the top a piece of iron still thinner; that called the outer tympan is fastened with hinges to the coffin: they are both covered with parchment; and between the two are placed blankets, which are necessary to take off the impression of the letters upon the paper. The ruffket p is a square frame of thin iron, fastened with hinges to the tympan; it is covered with paper cut in the necessary places, that the feet, which is put between the ruffket and the great or outward tympan, may receive the ink, and that nothing may hurt the margins. To regulate the margins, a sheet of paper is fastened upon this tympan, which is called the tympan-sheet; and on each side is fixed an iron point, which makes two holes in the sheet, which is to be placed on the same points, when the impression is to be made on the other side. In preparing the press for working, the parchment which covers the outer tympan is wetted till it is very soft, in order to render the impression more equal; the blankets are then put in, and secured from slipping by the inner tympan: then while one pressman is beating the letter with the balls q, covered with ink taken from the ink-block, the other person places a sheet of white paper on the tympan-sheet, turns down the ruffket upon it to keep the paper clean and prevent its slipping; then bringing the tympan upon the form, and turning the rounce, he brings the form with the stone, &c. weighing about 300 pounds weight, under the platten; pulls with the bar, by which means the platten presses the blankets and paper close upon the letter, whereby half the form is printed; then easing the bar, he draws the form still forward, gives a second pull; and letting go the bar, turns back the form, takes up the tympan and ruffket, turns out the printed sheet, and lays on a fresh one; and this is repeated till he has taken off the impression upon the full number of sheets the edition is to consist of. One side of the sheet being thus printed, the form for the other is laid upon the press, and worked off in the same manner.

Chinese Printing, is performed from wooden planks or blocks, cut like those used in printing of calico, paper, cards &c.

Rolling press Printing, is employed in taking off prints or impressions from copper-plates engraved, etched, or scaped as in mezzotint. See Engraving.

This art is said to have been as ancient as the year 1540, and to owe its origin to Finiguerra, a Florentine goldsmith, who pouring some melted brimstone on an engraved plate, found the exact impression of the engraving left in the cold brimstone, marked with black taken out of the strokes by the liquid sulphur. Upon this he attempted to do the same on silver-plates with wet paper, by rolling it smoothly with a roller; and this succeeded: but this art was not used in England till the reign of King James I when it was brought from Antwerp by Speed. The manner of the rolling-press, the composition of the ink used therein, and the manner of applying both off prints, are as follow.

The rolling-press AL (Plate CXLVII. fig. 2) may be divided into two parts, the body and carriage; the body consists of two wooden cheeks PP placed perpendicularly on a stand or foot LM, which sustains the whole press. From the foot likewise are four other perpendicular pieces c,c,c,c, joined by other cross or horizontal ones d,d,d, which serve to sustain a smooth even plank or table HIK, about four feet and a half long, two feet and a half broad, and an inch and a half thick. Into the cheeks go two wooden cylinders or rollers, DE, FG, about fix inches in diameter, borne up at each end by the cheeks, whose ends, which are leftened to about two inches diameter, and called trunnions, turn in the cheeks about two pieces of wood in form of half-moons, lined with polished iron to facilitate the motion. Lastly, to one of the trunnions of the upper roller is fastened a cross, consisting of two levers A,B, or pieces of wood, traversing each other, the arms of which cross serve instead of the bar or handle of the letter-presses, by turning the upper roller, and when the plank is between the two rollers, giving the fame motion to the under one, by drawing the plank forward and backward.

The ink used for copper-plates, is a composition made of the stones of peaches and apricots, the bones of sheep, and ivory, all well burnt, and called Frankfort black, mixed with nut-oil that has been well boiled, and ground together on a marble, after the same manner as painters do their colours.

The method of printing from copper-plates is as follows. They take a small quantity of this ink on a rubber made of linen-rags, strongly bound about each other, and therewith smear the whole face of the plate as it lies on a grate over a charcoal-fire. The plate being insufficiently inked, they first wipe it over with a foul rag, then with the
the palm of their left hand, and then with that of the right; and to dry the hand and forward the wiping, they subit from time time in whiting. In wiping the plate perfectly clean, yet without taking the ink out of the engraving, the address of the workman confines. The plate thus prepared, is laid on the plank of the press; over the plate is laid the paper, first well moistened, to receive the impression, and over the paper two or three folds of flannel. Things thus disposed the arms of the crofs are pulled by that means the plate with its furniture passed through between the rollers, which pinching very strongly, yet equally, presses the moistened paper into the strokes of the engraving, whence it licks out the ink.

PRIOR, the superior of a convent of monks, or the next under the abbot. See Abbots.

PRISCILLIANISTS, in church-history, Christian heretics, called from their leader Priscillian, a Spaniard by birth, and bishop of Avila. He is said to have practised magic, and to have maintained the principal errors of the Manichees; but his peculiar tenet was, that it is lawful to make false oaths, in order to support one's cause and interest.

PRISM, an oblong solid, contained under more than four planes whose bases are equal, parallel, and alike situated.

PRIVATEERS, in maritime affairs, a kind of private man of war, fitted out by private persons at their own expense; who have leave granted them to keep what they can take from the enemy, allowing the admiral his commission, or the king's prerogative; and that either by a man of war, a privateer, &c. having a commission for that purpose.

PROBATION, in the universities, is the examination and trial of a student who is about to take his degree.

PROBATIONER, in the church of Scotland, a student in divinity, who bringing a certificate from a professor in an university of his good morals, and his having performed his exercises to approbation, is admitted to undergo several trials.

PROBE, a surgeon's instrument for examining the circumstances of wounds, ulcers, and other cavities, searching for stones in the bladder, &c.

PROBLEM, in logic, a proposition that neither appears absolutely true nor false; and, consequently, may be affirmed either in the affirmative or negative.

PROBLEM, in geometry, is a proposition, wherein some operation or construction is required; as to divide a line or angle, erect or let fall perpendiculars, &c. See Geometry.

PROBOSCIDES, in natural history, is the trunk or snout of an elephant, and some other animals and insects.

PROCATEARCTIC CAUSE, in medicine, the preceding, or pre-dipping cause or occasion of a disease.

PROCELEUSMATICUS, in the ancient poetry, a foot consisting of four short syllables, or two pyrrhichiaules; as, hominibus, etc.

PROCELLARIA, in ornithology, a genus of birds, belonging to the order of anseres. The beak is somewhat compressed, and without teeth; the mandibles are equal, the inferior one being crooked at the point; the feet are palmated, the hind claw being feeril, without any toe. There are six species, principally distinguished by their colour.

PROCES, in law, denotes the proceedings in any cause, real or personal, civil or criminal, from the original writ to the end thereof.

PROCES, in chemistry, the whole course of an experiment or series of operations tending to produce something new.

PROCESSION, a ceremony in the Roman church, consisting of a formal march of the clergy and people, putting up prayers, &c. and in this manner visiting some church, &c. They have also processions of the host or sacrament. See Host.

PROCLAMATION, a public notice given of any thing of which the king thinks proper to advertise his subjects.

Proclamations are a branch of the king's prerogative; and no person can make them without the king's authority, except mayors of towns, &c. by custom of privilege. Proclamations which require the people to do or not to do certain things, have the force of laws; but then they are supposed to be consistent with the laws already in being, otherwise they are superceded.

PROCONSUL, a Roman magistrate, sent to govern a province with confular authority.

PROCUREMENT, the begetting and bringing forth children. See Generation and Midwifery.

PROCTOR, a person commissioned to manage another person's cause in any court of the civil or ecclesiastical law.

PROCURATION, an act or instrument by which a person...
PROFANE, a term used in opposition to holy; and, in general, applied to all persons who have not the sacred character, and to things which do not belong to the service of religion.

PROFESSION, among the Romanists, denotes the entering into a religious order, whereby a person offers himself to God by a vow of inviolably observing obedience, charity, and poverty.

PROFESSOR, in the universities, a person who teaches or reads public lectures in some art or science from a chair for the purpose.

PROFILE, in architecture, the draught of a building, fortification, &c. wherein are expressed the several heights, widths, and thicknesses, such as they would appear were the building cut down perpendicularly from the roof to the foundation.

PROFLUVIUM, in medicine, denotes a flux, or liquid evacuation, of any thing.

PROGNOSTICS, among physicians, signifies a judgment concerning the event of a disease; as, whether it shall end in life or death, be short or long, mild or malignant, &c.

PROGRESSION, in general, denotes a regular advancing, or going forward in the same course and manner. See Arithmetic, Algebra, and Geometry.

PROJECTION, in mechanics, the act of communicating motion to a body, from thence called projectile. See Mechanics.

PROJECTURE, in architecture, the out-jutting, prominence, or emboassing, which the moldings and other members have beyond the naked wall, column, &c. See Architecture.

PROLAPSUS, in surgery, a prolapsion, or falling out of any part of the body from its natural situation; thus we say prolapsus intellini, a prolapsion of the intestine, &c. See Surgery.

PROLATE, in geometry, an epithet applied to a spheroid produced by the revolution of a semi-ellipsoid about its larger diameter.

PROLEGOMENA, certain preparatory observations or discourses prefixed to a book, &c. containing something necessary for the reader to be apprised of, to enable him the better to understand the book, or to enter deeper into the science, &c.

PROLEPSIS, a figure in rhetoric, by which we anticipate or prevent what might be objected by the adversary.

PROLEPTIC, an epithet applied to a periodical disease which anticipates, or whose paroxysm returns sooner and sooner every time, as is frequently the case in agues.

PROLIFIC, something that has the qualities necessary for generating.

PROLIXITY, in discourse, the fault of entering into too great a detail, of being too long, precise, and circumstantial, even to a degree of tediousness.

PROLOGUE, in dramatic poetry, a discourse addressed to the audience before the drama or play begins. The original intention was to advertise the audience of the subject of the piece, and to prepare them to enter more easily into the action, and sometimes to make an apology for the poet.

PROMETHEUS, in the ancient astronomy, the name of the constellation now called Hercules. See Astronomy, p. 487.

PROMISE, in law, is when upon any valuable consideration one binds himself by word of mouth to another to perform a thing agreed on.

PROMONTORY, in geography, a high point of land or rock projecting out into the sea; the extremity of which towards the sea, is called a cape, or headland.

PROMULGATED, something published or proclaimed, and generally applied to a law, to denote the publishing or proclaiming to the people.

PRONATION. See Anatomy, p. 179.

PRONATORS, in anatomy. See Anatomy, p. 198.

PRONOUN, in grammar, a declinable part of speech used to evince the truth of any thing.

PRONUNCIATION, in grammar, the manner of articulating or sounding the words of a language. See Grammar.

PROOF, in law, &c. denotes the mediums or arguments used to evince the truth of any thing.

PROPAGATION, the act of multiplying the kind. See Generation.

PROPER, something naturally and essentially belonging to any thing.

PROPERTY, in a general sense, that which constitutes or denotes a thing proper; or it is a particular virtue or quality which nature has bestowed on some things exclusive of all others: thus colour is a property of light; extension, figure, divisibility, and impenetrability, are properties of body.

PROPERTY, in law, is described to be the highest right a person has, or can have, to any thing.

PROPHECY, a prediction made by divine inspiration.

PROPHET, in general, a person who foretells future events; but particularly applied to such inspired persons among the Jews as were commissioned by God to declare his will and purposes to that people. Among the canonical books of the Old Testament, we have the writings of sixteen prophets, four of which are denominated the greater prophets, viz. Isaiah, Jeremiah, Ezekiel, and Daniel, fo called from the length or extent of their writings, which exceed those of the others, viz. Hosea, Joel, Amos, Obadiah, Jonah, Micah, Nahum, Habbukuk, Zephaniah, Haggai, Zechariah, and Malachi, who are called the leffer prophets from the shortness of their writings. The Jews do not place Daniel among the prophets, because, they say, he lived the life of a courtier rather than that of a prophet.

PROPIATION, in theology, a sacrifice offered to God to atone for his wrath, and render him propitious. Among the Jews there were both ordinary and public sacrifices, as holocausts, &c. offered by way of thanksgiving; and extraordinary ones, offered by particular persons guilty of any crime, by way of propitiation. The Romish church believe the mass to be a sacrifice of propitiation for the living and the dead. The reformed churches allow of
PROTEA, in botany, a genus of the tetrandria monogynia class. The calyx consists of three segments; it has no corolla, and but one seed. There is only one species, a native of Virginia.

PROSODY, that part of grammar which treats of the quantities and accents of syllables. See Grammar.

PROSOPOPOEIA, a figure in rhetoric, whereby we raise qualities of things inanimate into persons.

PROTUBERANCE, is an eminence, whether natural or artificial.

PROTRACTOR, the name of an instrument used for projecting or laying down on paper the angles of a field, or other figure. See Geometry.

PROPOSITION, in logic, part of an argument wherein some quality, either negative or positive, is attributed to a subject. See Logic.

PROPORTION, when two quantities are compared one with another, in respect of their greatness or smallness, the comparison is called ratio, rate, or proportion. See Algebra, Arithmetic, and Geometry.

PROSURE, the dictionary of P票rse, comprising

PROTEM, in botany, a genus of the tetrandria monogynia class. The petal consists of four segments surrounding the germen; it has no proper calix; and the receptacle is paleaceous. There are two species, both natives of the Cape of Good Hope.

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PROTECTOR, a person who undertakes to shelter and defend the weak, helpless, and distressed.

PROTESTANT, a name first given in Germany to those who adhered to the doctrine of Luther, because, in 1529, they protested against a decree of the emperor Charles V. and the diet of Spire, declaring that they appealed to a general council. The same name has also been given to those of the sentiments of Calvin, and is now become a common denomination for all those of the reformed churches.

PROTONOTARY, a term which properly signifies first notary, and which was anciently the title of the principal notaries of the emperors of Constantinople.

PROTOTYPE, is the original or model after which a thing was formed; but chiefly used for the patterns of things to be engraved, cast, &c.

PROTRACTOR, the name of an instrument used for projecting or laying down on paper the angles of a field, or other figure. See Geometry.

PROTUBERANCE, is an eminence, whether natural or artificial, that projects or advances out beyond the rest.

PROVEDITOR, an officer in several parts of Italy, particularly at Venice, who has the direction of matters relating to policy.

PROVENCE, a province or government of France, bounded by Dauphine on the north; by Piedmont on the east; by the Mediterranean on the south; and by the river Rhone, which separates it from Langedoc, on the west. It is about an hundred miles long, and near as many broad.

PROVERB, according to Camden, is a concise, witty, and wise speech, grounded upon experience, and for the most part containing some useful instructions. Book of Proverbs, a canonical book of the Old Testament, containing a part of the prophecies of Solomon the son of David king of Israel. The first twenty-four chapters are acknowledged to be the genuine work of that prince; the next five chapters are a collection of several of his prophecies, made by order of king Hezekiah; and the two last seem to have been added, though belonging to different and unknown authors, Agur the son of Jekiel, and King Lemuel.

In this excellent book are contained rules for the conduct of all conditions of life; for kings, courtiers, masters, servants, fathers, mothers, children, &c.

PROVIDENCE, the conduct and direction of the several parts of the universe, by a superior intelligent Being.

PROVIDENCE PLANTATION, a colony of New-England, which, with Rhode-Island, constitutes a charter government: its chief town is Newport.

PROVIDENCE is also one of the Bahamas islands, planted and fortified by the English: W. lond. 76°, N. lat. 29°.

PROVENCE, in Roman antiquity, a country of considerable extent, which, upon being entirely reduced under the Roman dominion, was new-modelled according to the pleasure of the conquerors, and subjected to the command of annual governors sent from Rome; being commonly obliged to pay such taxes and contribution as the Senate thought fit to demand.
comprising several cities, towns, &c. all under the same government, and usually distinguished by the extent either of the civil or ecclesiastical jurisdiction.

PROVINCIAL, something relating to a province. See the preceding article.

PROVOST, of a city or town, is the chief municipal magistrate in several trading cities, particularly Edinburgh, Paris, &c. being much the same with mayor in other places.

He presides in city-courts, and, together, with the bailies, who are his deputies, determines in all differences that arise among citizens.

The provost of Edinburgh, as well as of all the other considerable towns in Scotland, has the title of lord; and the former calls yearly conventions of the royal boroughs to Edinburgh by his missives.

PROW, denotes the head or fore part of a ship, particularly in a galley, being that which is opposite to the poop or stern.

PROXIMITY, denotes the relation of nearness, either in respect of place, blood, or alliance.

PROXY, a person who officiates as a deputy in the room of another.

PRUCH, or Bruch, a town of Austria, in Germany, twenty-two miles south-east of Vienna.

PRUCK, or Brugg, of Switzerland, in Germany, sixty miles south-west of Vienna.

PRUNES, are plums dried in the sun or in an oven.

PRUNING, in gardening and agriculture, is the lopping off the superfluous branches of trees, in order to make them bear better fruit, grow higher, or appear more regular.

PRUNUS, in botany, a genus of the icofandria monogynia class. The calyx consists of five segments, and the corolla of five petals; and the shell of the drupe is full of prominent futures. There are 13 species, five of them natives of Britain, viz. the infititia, or black bullace-tree; the pinifolia, or bloe-tree; the padus, or birds cherry; the avium, or common wild cherry; and the cerasus, or black cherry.

PRURITIS, denotes an itching sensation.

PRUSIA, a province of Poland, situated on the coast of the Baltic sea, and divided into regal and ducal Prussia, the first subject to Poland, and the last to the king of Prussia.

PRUSSIA, a province of Poland, situated on the coast of the Baltic sea, and divided into regal and ducal Prussia, the first subject to Poland, and the last to the king of Prussia.

PRYTANES, in Grecian antiquity, were the presidents of the senate, who formed the body of the ancients called the prytanes, or other herb of the same intention.

The prytanes of the tribes did not govern all at once, but ten to the hundred and fifty Psalms of David, a canonical book of the Old Testament.

Most of the Psalms have a particular title, signifying either the name of the author, the person who was to set it to music or sing it, the instrument that was to be used, or the subject and occasion of it. Some have imagined, that David was the sole author of the book of Psalms; but the titles of many of them prove the contrary, as Psalm xix. which appears to have been written by Moses. Many of the Psalms are inscribed with the names Korah, Judah, &c. from the persons who were to sing them.

PSALMODY, the art or act of singing psalms. See the preceding article.

PSALTER, the name with the book of Psalms. See Psalm.

Among the religious, in the Popish countries, the term psalter is also given to a large chaplet or rosary, consisting of an hundred and fifty beads, according to the number of psalms in the psalter.

PSALTERY, a musical instrument, much in use among the ancient Hebrews, who called it nebel.

We know little or nothing of the precise form of the ancient psaltery.

PSIDICM, in botany, a genus of the icofandria monogynia class. The calyx consists of five segments, and the corolla of five petals; the berry has but one cell, containing many seeds. There are two species, both natives of India.

PSITTACUS, in ornithology, a genus belonging to the order of picae. The beak is hooked, the superior mandible being furnished with a moveable wax; the nostrils are placed at the base of the beak; the tongue is fleshly, blunted, and entire; and the feet are fitted for climbing. There are 47 species, distinguished by their colour, and the length of their tails. This genus includes the parrot-kind, which are all natives of warm climates.

PSOAS, in anatomy. See Anatomy, p. 203.

PSORALIA, in botany, a genus of the diadelphia decandria class. The calyx consists of five segments, the corolla of five petals; the berry has but one cell, containing many seeds. There are 14 species, none of them natives of Britain.

PSOS, in anatomy. See Anatomy, p. 203.

PTERIS, in botany, a genus of the cryptogamia silicum class. The fructification is situate in lines near the margin. There are 19 species, only one of them, viz. the aquilina, or female fern, is a native of Britain.

PTERMÉUS, in botany. See Achillea.

PTERETAL, in botany, a genus of the tetrandria monogynia class. The calyx consists of four segments, and the corolla of four petals; the fruit is a roundish membrane, with one seed in the centre. The species are two, none of them natives of Britain.

PTERIS, in botany, a genus of the cryptogamia siliac claf. The fructification is situate in lines near the margin. There are 19 species, only one of them, viz. the aquilina, or female fern, is a native of Britain.

PTERYGOID, something resembling a wing.

PTERYGOID.EUS, in anatomy. See Anatomy, p. 221.

PTISAN, is properly barley decorticled, or deprived of its hulls, by beating in a mortar, as was the ancient practice, though the cooling potion, obtained by boiling such barley in water, and afterwards sweetening the liquor with liquorice-root, is what at present goes by the name of ptisani: and to render it laxative, some add a little fenna, or other herb of the same intention.

PTOLEMAIC System of Astronomy, is that invented by Claudius Ptolemaus, a celebrated al atronomer and mathematician of Pelusium, in Egypt, who lived in the beginning of the 2nd century of the Christian era.

This hypothesis supposes the earth immovable fixed in the centre, not of the world only, but also of the universe:
verse; and that the sun, the moon, the planets, and stars,
all move about it, from east to west, once in twenty-four
hours, in the order following, viz. the moon next to the
earth, then mercury, venus, the sun, mars, jupiter, fa-
turn, the fixed stars, the first and second crystalline heav-
vens, and above all the fiction of their primum mobile.
PTyalism, in medicine, a salivation, or frequent and
copious discharge of saliv.
Puberty, among civilians, &c. the age wherein a per-
son is capable of procreation, or begetting children. See
Law.
Pubes, among anatomists, &c. denotes the middle part
of the hypogastric region of the abdomen, lying between
the two inguina or groins. See Anatomy, p. 277.
Publican, among the Romans, one who farmed the
taxes and public revenues.
Publication, the act of making a thing known to the
world; the same with promulgation.
Pubenda, the parts of generation in both sexes. See
Anatomy, p. 270.
Puerility, he adds, is the common fault of
some longer than its body, a native of America.
Pugil, in physic, such a quantity of flowers, feeds,
or the like, as may be taken up between the thumb and
two fore-fingers.
It is esteemed to be the eighth part of the manipule or
handful.
Pulex, in zoology, a genus of insects belonging to the
order of aptera. It has six feet fixed for leaping, and
two eyes; the feelers are like threads; the rostrum is
inflated, fetectous, and armed with a sting; and the
belly is compresed. There are two species, viz. one of
defects, with a proboscis shorter than its body, a native
of Europe and America: and the penetrans, with a pro-
obscis longer than its body, a native of America.
Puleley, in mechanics, one of the mechanical powers.
See Mechanics.
Pulmo, the lungs, in anatomy. See Anatomy, p.
280.
Pulmonaria, in botany, a genus of the pentandria
monogynia clafs. The corolla is funnel-shaped; and the
calyx has five sides. There are seven species, two of
them natives of Britain, viz. the officinalis, or buglos-
cowflips, the leaves of which are reckoned pedoral and
cordiac; and the maritima, or sea-buglofls.
Pulmonary Vessels, in anatomy. See Anatomy,
Part III. and IV. and p. 280.
Pulp, in pharmacy, the fefhy and succulent part of fruits,
extracted by infusion or boiling, and passed through a
sieve.
Pulpit, an elevated place in a church, whence sermons
are delivered: the French give the same name to a read-
ing desk.
Pulsatilla, in botany. See Anemone.
Pulse, in the animal economy, denotes the beating or
throbhing of the heart and arteries.
With regard to motion, the pulses are reckoned only
four, great and little, quick and slow. When quicknfs
and greatnfs are joined together, it becomes violent;
and when it is little and slow, it is called a weak pulse,
They are also said to be frequent and rare, equal and un-
equal; but these are not the essential affections of motion.
Frequency and quickness are often confounded with each
other. A pulse is said to be hard or soft, with regard
to the artery, according as it is tenfes, resistent, and hard,
or flaccid. soft, and lax. Add to thefe, a convulsive pulse;
which does not proceed from the blood, but from the
state of the artery, and is known by a tremulous subful-
tory motion, and the artery seems to be drawn upwards:
this, in acute fevers, is the sign of death; and is said to
be the pulse in dying persons, which is likewise generally
unequal and intermitting. A great pulse shows a more
copious afflux of the blood to the heart, and from thence
into the arteries; a little pulse, the contrary.
Pulse is also used for the stroke with which any medium is
affected by the motion of light, found, &c. through it.
Pulse, in botany, a term applied to all those grains or
seeds which are gathered with the hand, in contradiftinc-
tion to corn, &c. which are reaped, or mowed: or it is
the seed of the leguminous kind of plants, as beans, vet-
ches, &c. but it is by some used for artichokes, alpar-
gus, &c.
Pulverization, the art of pulverizing, or reducing
a dry body into a fine powder; which is performed in
frangible bodies, by pounding or beating them in a mortar,
&c.
Pulvis, a powder. See Powder.
Pumice, in natural history, a flag or cinder of some fof-
fl, originally bearing another form, and only reduced to
this state by the action of the fire, though generally rank-
ed by authors among the native frones. It is a lax and
fponge matter, frequently of an obscure striated texture
in many parts, and always very cavernous and full of
holes; it is hard and harfh to the touch, but much light-
er than any other body that comes under the clafs of
fones. It is found in mafles of different fizes, and of
a perfectly irregular shape, from the bignefs of a pigeon’s
egg, to that of a bullfe. We have it from many parts of
the world, but particularly from about the burning
mountains Etna, Vefuvius, and Hecla, by whose eru-
pions it is thrown up in vast abundance; and being by its
lightnefs supported in the air, is carried into seas at some
diftancc by the winds, and thence to distant shores. The
great ufe of the pumice among the ancients, feems to
have been as a dentifrice, and at prefent it is retained in
the shops on the fame account.
Pump, in hydraulics. See Hydrostatics, p. 808. &c.
Air-Pump. See Pneumatics, p. 491.
Pun, or Punn, a conceit arifting from the use of two words
that agree in sound, but differ in the fene. Afcwelle-
describes two or three kinds of puns among the beaties
of good writing, and produces instances of them out of
some of the greatest authors in the Greek tongue. Ci-
cero has sprinkled feveral of his works with puns; and
in his book, where he lays down the rules of oratory,
quotes abundance of fayings, which he calls pieces of wit,
that upon examination prove perfect puns.
Punch, an instrument of iron or steel, used in feveral arts,
for the piercing or flamping holes in plates of metal, &c.
being to contrived as not only to perforate, but to cut
out and take away the piece.
Punchion, a little block or piece of steel, on one end
whereof is some figure, letter, or mark, engraven either
in
PURIFICATION, in matters of religion, a ceremony on the end not engraved.

PURIFEO is also a measure for liquids, containing an hogfhead and one third, or eighty-four gallons.

PUNCTUATION, in grammar, the art of pointing, or of dividing a discourse into periods, by points expressing the pauses to be made in the reading thereof.

PUNCTUM SALIENTS, in anatomy, the first rudiments of the heart in the formation of the fetus, where a throbbing motion is perceived.

PUNCTURE, in surgery, any wound made by a sharp-pointed instrument.

PURCHASE, in law, the buying or acquiring of lands, &c. with money, by deed or agreement, and not by descent or right of inheritance.

PURE, something free from any admixture of foreign or heterogeneous matters: thus we say pure fire, &c.

PURPLE, in heraldry, according to some, was excluded by the ancient heralds as only an imperfect colour. In the coats of noblemen it is called amethyft; and fixing it with alum.

PURLE, or Purlieu, signifies all that ground near a woods; either bathing; or only wading the face, hands and feet. The first is requested only in extraordinary cases, as after having lain with a woman, touched a dead &c. But left so necessary a preparation for their devotion should be omitted, either where water cannot be had, or when it may be prejudicial to a person's health, they are allowed in such cases to make use of fine sand or dust instead of it; and then they perform this duty by clapping their open hands on the sand, and passing them over the parts, in the same manner as if they were dipped in water.

There were also many legal purifications among the Hebrews. When a woman was brought to bed of a male-child, she was esteemed impure for forty days; and when of a female, for sixty; at the end of which time she carried a lamb to the door of the temple, to be offered for a burnt-offering, and a young pigeon or turtle for a sin-offering, and by this ceremony she was cleansed or purified.

PURIM, or the feast of lots, a solemn festival of the Jews, instituted in memory of the deliverance they received from Haman's wicked attempt to destroy them, by means of Mordecai and Esther.

PURITAN, a name formerly given in derision to the dissenters from the church of England, on account of their professing to follow the pure word of God, in opposition to all traditions and human constitutions.

PURPLE, a colour composed of a mixture of red and blue. A beautiful transparent purple for painting may be made by boiling four ounces of rasper balsam-wood in a pint of stale beer, and half an ounce of logwood, till the liquor is heightened to the colour you desire, which may be known by dipping a piece of paper in it. If you find it too red, add a quarter of an ounce more of logwood, which will render it still deeper; and by this method you may bring it to any degree of purple, by putting in either more or less logwood to the former composition, and fixing it with alum.

PURPURA, in natural history. See MUREX.

PURPURE, or Purple, in heraldry, according to some, is one of the five colours of armories, compounded of gules and azure, bordering on violet, and, according to others, of a great deal of red and a little black. But it was excluded by the ancient heralds as only an imperfect colour. In the coats of noblemen it is called amethyft; and in those of princes, mercury. It is represented in engraving, by diagonal lines drawn from the sinister chief to the dexter base points. See Plate CXLVII. fig. 3.

PURSER, an officer aboard a man of war, who receives her victuals from the victualler, feeds that it be well flowed, and
and keeps an account of what he every day delivered to the steward. He also keeps a list of the ship's company, and sets down exactly the day of each man's admission, in order to regulate the quantity of provisions to be delivered out, and that the paymaster or treasurer of the navy may suffice out the disbursements, and pay off the men, according to his book.

PURSLAIN, in botany. See Portulaca.

PUS, in medicine, a white or yellowish putrid matter, deemed offensive to the body of the sick, &c. as contradistinct from the preambles.

PURULENT, in medicine, something mixed with or partaking of pus or matter.

PUS, in medicine, a white or yellowish putrid matter, designed by nature for the healing and cementing of wounds or sores.

PUSTULE, a pimple, or small eruption on the skin full of pus; such are the pustules of the small-pox and fmall-pox. See Medicine.

PUTTORIUS in zoology. See Mustela.

PUTREFACTION. See Chemistry, p. 98.

PUTTY, is a kind of paste, compounded of whiting and linseed oil, beaten together to the consistence of thick dough.

It is used by glaziers for the fastening in the squares of glass in sash-windows, and by painters for filling up the crevices and holes in timber and wainscots, &c.

PYCNOSYLLE, in the ancient architecture, is a building where the columns stand very close to each other; only one diameter and a half of the column being allowed for the intercolumniations.

PYGARGUS, in ornithology. See Falco.

PYGMY, a person not exceeding a cubit in height.

This appellation is given by the ancients to a fabulous nation said to have inhabited Thrace; who brought forth their augury: sometimes they threw pitch on it; and, if it took fire immediately, they esteemed it a good augury.

PYRGUS, in architecture. See Anatomy, p. 238.

PYRAMID, in geometry, a solid standing on a triangular, square, or polygonal base, and terminating in a point at the top; or, according to Euclid, it is a solid figure consisting of several triangles, whose bases are all in the same plane, and have one common vertex.

PYRAMIDALIS, in anatomy. See Anatomy, p. 195.

PYRAMIDALIA CORPORA, in anatomy. See Anatomy, p. 205.

PYROMANCY, a kind of divination by means of fire. The ancients imagined they could foretell future events, by inspecting fire and flame; and to this end, they considered its direction, which way it turned; sometimes they added other matters to the fire, such as a vessel full of urine, having its neck bound about with wool, watching narrowly on which side it burnt, and thence taking their augury: sometimes they threw pitch on it; and, if it took fire immediately, they esteemed it a good augury.

PYROTECHNY, the art of fire, or science which teaches the management and application of fire in several operations. See Chemistry.

PYROTICS, in medicine, caustics, or remedies, either actually or potentially hot; and which accordingly will burn the flesh, and raise an ulcer. See Caustics.

PYRRHICUS, in the Greek and Latin poetry, a foot consisting of two syllables, both short; as, Δυς.

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PYRRHHONIANISTS, a sect of ancient philosophers, so called from Pyrrho, a native of Elis, in Peloponnesus. The opinions of these philosophers, who were also called sceptics, terminated in the incomprehensibility of all things, in which they found reason both for affirming and denying; accordingly they seemed, during their whole lives, to be in search of truth, without ever acknowledging that they had found it: hence the art of disputing upon all things, without ever going farther than suspending our judgment, is called pyrrhonism.

PYRRUS, in botany, a genus of the decandria monogynia class. The calyx consists of five segments, and the corolla of five petals; and the capsule has five cells. There are four species, three of them natives of Britain, viz. the roundifolia, or common winter-green; the minor, or lesser winter-green; and the secunda, or dented leaved winter-green.
to Livy, in the reign of Servius Tullius, in the year of the world 2472.

His maxims of morality were admirable; for he was for having the study of philosophy solely tend to elevate man to a resemblance of the Deity. He believed that God is a soul diffused through all nature, and that from him human souls are derived; that they are immortal; and that men need only take pains to purge themselves of their vices, in order to be united to the Deity. He made morality the principle of all things; and believed, that between God and man there are various orders of spiritual beings, who are the ministers of the Supreme Being. He condemned all images of the Deity, and would have him worshipped with as few ceremonies as possible. His disciples brought all their goods into a common stock, and in the pleasures of society, abstained from swearing, eating anything that had life, and believed in the doctrine of a metempsychosis. See Metempsychosis.

Pythagoras made his scholars undergo a severe noviciate of silence for at least two years; and it is said, that the delay where he discerned too great an itch for talking, he extended it to five. His disciples were therefore divided into two classes: of which the first were simple hearers; and the last such as were allowed to propose their difficulties, and learn the reasons of all that was taught there. The Pythagoreans, it is said, on their rising from bed, roused the mind with the sound of the lyre, in order to make them more fit for the actions of the day; and at night resumed the lyre, in order to prepare themselves for sleep, by calmaing all their tumultuous thoughts. The figurative manner in which he gave his instructions, was borrowed from the Hebrews, Egyptians, and other orientals. Some think he derived his philosophy from the books of Moses, and that he converted with Ezekiel and Daniel at Babylon; but this is mere conjecture.

Some authors say, that he left nothing in writing; but Laertius and others attribute several treatises to him. His golden verses, attributed by some to one of his disciples, are allowed to be an exact copy of the sentiments of that divine philosopher, from whose school proceeded the greatest philosophers and legislators.

Pythia, in antiquity, the priestess of Apollo at Delphi, by whom she delivered oracles; she was thus called from the god himself, who was denominated Apollo Pythis, from his slaying the serpent Python.

Q.

Quack, among physicians, the same with empiric. See Empiric.

Quadragesima, a denomination given to lent, from its consisting of forty days. See Lent.

Quadrangle, in geometry, the same with a quadrilateral figure, or one consisting of four sides and four angles.

Quadrans, the quarter or fourth part of any thing, particularly the as, or pound.

Quadrant, in geometry, the arch of a circle, containing 90°, or the fourth part of the entire periphery. It also denotes a mathematical instrument, of great use in astronomy and navigation, for taking the altitudes of the sun and stars. See Astronomy, p. 451.

Quadrat, a mathematical instrument, called also a geometrical square, and line of shadows: it is frequently an additional member on the face of the common quadrant, as also on those of Gunter's and Sutton's quadrant.

Quadrant, in astrology, the same with quartile. See Quartile.

Quadrat, in printing, a piece of metal cast like the letters, to fill up the void spaces between words, etc. There are quadrats of different sizes, as m-quadrat, n-quadrat, etc., which are, respectively, of the dimensions of these letters.

Quadratic Equation, in algebra. See Algebra, p. 90.

Quadratrix, in geometry, a mechanical line, by means of which we can find right lines equal to the circumference of circles, or other curves, and their several parts.

Quadratrix of Dinostrates, so called from its inventor Dinostrates, is a curve, whereby the quadrature of the circle is effected mechanically.

Quadrature, in geometry, denotes the squaring, or reducing a figure to a square. Thus, the finding of a square, which shall contain just as much surface or area as a circle, an ellipse, a triangle, etc. is the quadrature of a circle, ellipse, etc. See Geometry.

Quadrature, in astronomy, that aspect of the moon, when it is 90° distant from the sun. See Astronomy.

Quadratus, in anatomy, a name given to several muscles on account of their square figure. See Anatomy, Part II.

Quadrel, in building, a kind of artificial stone, so called from its being perfectly square.

The quadrates are made of chalky earth, etc., and dried in the shade for two years. These were formerly in great request among the Italian architects.

Quadriennium Utile, in Scots law. See Law, Tit. vii. 17.

Quadriga, in antiquity, a car or chariot drawn by four horses.

On the reverses of medals, we frequently see the emperor or victory in a quadriga, holding the reins of the horses; whence these coins are, among the curious, called nummi quadrigati, and victoriati.

Quadrilateral, in geometry, a figure whose perimeter consists of four right lines, making four angles; whence it is also called a quadrangular figure.

Quadrille, a little troop or company of cavaliers, pompously dressed, and mounted, for the performance of caroufals.
QUESTUS, in law, signifies whatever a person has by contract, in Scots law. See Law, Tit xxii. 14.

QUAIL. See Tetrao.

QUADRUPEDS in zoology. See Natural History.

Quadrille, is also a game at cards, to be learned only by practice.

QUADRUPEDS, in zoology. See Natural History.

QUASI CONTRACT, in Scots law. See Law, Tit xxii. 14.

QUESTUS, in law, signifies whatever a person has by purchase; as hereditas denotes that which one has by descent, or hereditary right.

QUAIL. See Tetrao.

QUAKERS, a religious society that began to be distinguished by this name in England, where it first took its rise, about the middle of the last century.

In treating of this people, we shall deviate from the generality of those who have mentioned them in their writings; by exhibiting the account which they give of themselves, without making ourselves answerable for their principles or their practices.

William Sewel, a Dutchman, published; in the year 1717, the history of this people. He was one of their preachers, a man of learning, and known to the public by his dictionary of the Dutch and English languages. He had access to all their records, corresponded with the most eminent, lived at the time when the facts he recorded were recent, and we have not heard that any part of his history has been controverted; and as we are informed that it has been published by the approbation of the quakers, we may therefore consider it as an authentic history of their rise, progress, and principal opinions.

George Fox, (for whose birth and parentage, see page 6th of Sewel's History, &c.) was the first of this people. He was of a grave, sedate turn from his infancy; always most true, and not unworthy the disquisitions of the a-
timents as a religious society; to have instituted one of the character, fortune, and understanding, and embodied collected from all professions, and most ranks, men of sanctity of his life, the simplicity of his doctrines, to have access to all their records, corresponded with the public by their apologists, who has largely commented on these topics in a work that has passed through no less than eight editions in English, and has been printed in most of the modern languages.

Their particularities of address, language, and behaviour; their declining the use of arms, even in their own offence; their refusing to pay tithes, or contribute to the support of ministers in any shape; likewise their refusing to swear or take an oath on any occasion whatever; have subjected them to much obloquy, and many grievous sufferings. On what principles, and by what arguments, they vindicate themselves from the objections raised against them by their adversaries, may be seen in this elaborate.
boration. Government has, however, in ma-
hended from a people who difclaim the ule of arms
end that nothing dangerous to fociety could be appre-
that their profeffions of confcientious fcruples were fincere,
ny inftances, extended to this people great indulgen-
both ofience and defenfive. The oeconomy of this so-
cies; convinced, no doubt, by their patient {offering,
had drawn together in many parts of England confiderable
}

gular meetings for difciplme. The following is, as
it expedient for their better government to ellablifli re-
nearly as we can colle<5i, the plan that is eltabltfhcd a-
complaints arifing among themfelves; to inquire into the
rality and conformity to their religious fentimentsg to al-
and to provide for their relief; to hear and determine
morgfl them.

Where there are any Quakers, they meet together e-
very month, to consider of the neceffities of their poor,
and to provide for their relief; to hear and determine
complaints arifing among themselves; to inquire into the
conversation of their repective members in regard to mo-
ality and conformity to their religious fentiments; to al-
low the paffing of marriages; and to enjoin a strict regard
the peace and good order of the fociety, the proper
ducation of their young people, and a general attention
to the principles and practices of their profeffions.

In every country where there are monthly meetings, a meet-
ing of the like kind is held, and for fimilar purposes, ev-
ey quarter. This meeting confists of deputies fent from
the several monthly meetings, who are charged with an-
ers in writing to queries propofed to them respecting
the good order of the fociety. At these meetings appeals
are received, in cafe of any difpujes; and differences fett-
lit, if poaffeible. Advices are given as occasions offer, and
affiftance aforded to any of the monthly meetings, in cafe
of a larger proportion of poor, or any fimilar expences.

As there are Quakers in moft parts of England, there are
few counties which have not thefe quarterly meetings. And from thefe are deputed 4, 6 or 8 of their members
once a-year to their annual assembly at London.

The annual meeting is commonly held in Whitsun-
weak, not from any fuperflitious reference, as they fay,
to the effufion of the Holy Ghost at the time of petcoft,
but merely as it is a feafon moft generally convenient
to the body. At this anniversary meeting, confifting of
deputies from every quarterly meeting, and a number of the
moft judicious of their perfusion in London, selected
for the purpoce of acting on all emergencies for the good
of the fociety, accounts are received of the state of the
fociety in every part of the world where it exists.

The deputies bring with them accounts signed by order of the
repective quarterly meetings, informing the yearly meet-
ing, if any diffufion appears; if there is anyneglecf in re-
gard to the religious education of their youth; if the poor
are well provided for; if they keep to their testimony a-
againp paying tythes, againp bearing arms; if they pay the
king his duties, customs, and excife, and forbear to deal
in goods fufpefted to be run. Appeals are here received,
and finally determined; propositions received, and con-
sidered; and rules formed on particular emergencies:
And, lafly, fuch advices are fent to the fubordinate
meetings as the particular or general flate of the fociety
requires.

Perhaps this is the only fociety in the world that have al-
lowed any fhare in the management of their affairs to the fe-
male fex; which they do upon the principle that male and fe-
amale are one in Chrift. Accordingly we find them in ev ery-
department of their inftitution. They have women-preach-
ers, for whom the celebrated Locke made an excellent apo-
logy. These have alo their meetings of discipline; in
which the like care is taken in regard to the female youth,
and the good order of their fex, as is done by the men
in respect to their own. And when we reflect what a nu-
ber of individuals of both fexes are kept in good order by
the police of this fociety, how few of them are brought into
courts of justice as delinquents, how peaceable their behavi-
our, and how exemplary their conduct, we cannot but think
their principles deferve a more accurate examination than
has hitherto been attempted, owing perhaps to the vulgarpre-
judices circulated againft them. We fhall clofe this article
with observing, that, according to the beft of our informa-
tion, neither their minifters, nor thoafe who have the prin ci-
care of the fociety, enjoy any pecuniary emolument or
advantages. A few clerks only receive salaries for keeping
their records; fo that perhaps there is not a religious
fociety now existing, where principle has greater influence
in promoting the ends of their inftitution.

It is remarkable, that all the fettlements of the Eu-
ropans in America, except the Quaker fettlement of Pen-
sylvania, were made by force of arms, with very little
regard to any prior title in the natives. The kings of
Spain, Portugal, France, and Britain, together with the
States of Holland, then the only maritime powers, gave
grants of fimilar parts of America as their people could lay
hold on, fludying only to avoid interference with their
European neighbours. But Mr Jen, being a Quaker,
did not think his powers from the hearty Charles II. a sufici-
tent title to the country fince called Pennsylvania: He there-
fore assemblfl the fachems or princes then in that coun-
try, and purchafed from them the extent of land that he
wanted. The government of this province is mofty in
the hands of the Quakers, who never have any quarrels
with the natives. When they Defire to extend their fett-
lements, they purchafe new lands of the fachems, never
taking any thing from them by force. How unlike is this
conduct to that of the Spaniards, who murdered millions
of the natives of Mexico, Terra Firma, Peru, Chili, &c.
The barbarities used to these poor Indians in conquering
their country, and forcing them to discover their gold,
are a reproach to human nature.

QUALITY, is defined by Mr Locke, to be the power
in a subjedt of producing any idea in the mind. See ME-
TAPHYSICS.

Chemical Qualities, those qualities principally intro-
uced by means of chemical experiments, as fufification, al-
malation, cupellation, volatilization, precipitation, &c.
See CHEMISTRY.

Quality is alfo used for a kind of title given to certain
persons, in regard of their territories, fignories, or other
pretentions.

QUAMSI, a province of China, bounded by the province
of Yunnan on the weft, by Quecheu on the north, by Quantum
on the eaf, and by Tongquin on the fouth.

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of Yunnan on the weft, by Quecheu on the north, by Quantum
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QUAMSI, a province of China, bounded by the province
of Yunnan on the weft, by Quecheu on the north, by Quantum
on the eaf, and by Tongquin on the fouth.
QUANTITY, any thing capable of estimation, or manifestation; or which, being compared with another thing of the same kind, may be said to be greater or less than it, equal or unequal to it. See Arithmetic, Algebra, Geometry.

QuANTITY, in grammar, an affection of a syllable, whereby its measure, or the time wherein it is pronounced, is ascertained; or that which determines the syllable to be long or short.

QUARANTINE, is used for a term of forty days, which vessels, coming from places suspected of contagion, are obliged to wait in certain places appointed to air themselves, before they come into port. See Lazar-house.

QUARRY, a place under ground, out of which are got marble, freestone, slate, lime-stone, or other matters proper for buildings.

QUARRY OF QUARREL, among glaziers, a pane of glass, cut in a diamond form.

QUART, a measure containing the fourth part of some other measure.

QUARTAN, in medicine, a species of intermittent fever. See Medicine.

QUARTATION, a method of purifying gold, by melting three parts of silver with one of gold, and then throwing the mixture into aqua-fortis. See Chemistry, p. 129.

QUARTER, the fourth part of anything.

Quarter, in weights, is generally used for the fourth part of an hundred weight avoirdupois, or 28 lb. Used as the name of a dry measure, quarter is the fourth part of a ton in weight, or eight bushels.

Quarter, in heraldry, the fourth part of the moon's period.

Quarter, in heraldry, is applied to the parts or members of the first division of a coat that is quartered, or divided into four quarters. See Quartering.

Franc Quarter, in heraldry, is a quarter single or alone; which is to possess one fourth part of the field. This makes one of the honourable ordinarv's of a coat.

Quarter Masters, or Quartermasters, in a man of war, are officers whose business is to rummage, flow, and trim the ship in the hold; to overlook the steward in his delivery of victuals to the cook, and in pumping or drawing out beer, or the like. They are also to keep their watch duly, in conning the ship, or any other duty.

Quarter Master, an officer in the army, whose business is to look after the quarters of the soldiers; of which there are several kinds, viz. The quarter-master general, whose business is to provide good quarters for the whole army; quarter-master of horse, he who is to provide quarters for a troop of horse; quarter-master of foot, he who is to provide quarters for a regiment of foot.

Quartering, in the seal language, is disposing the ship's company at an engagement, in such a manner as that each may readily know where his station is, and what he is to do.

Quartering, in heraldry, is dividing a coat into four or more quarters or quarterings, by parting, coupling, &c. that is, by perpendicular and horizontal lines, &c.

Quatuor vir, in antiquity, formerly written III. VIR, a Roman magistrate who had three colleges joined with him in the Roman administration, and had the care of conducting and letting the colonies sent into the provinces.

There were also quatuor-viri appointed to inspect and take care of repairs, &c.

Quaver, in music, a measure of time equal to half a crotchet, or an eighth of a semibreve. See Music.

Quebec, the capital of Canada, in North America, situated on the west side of the river of St. Lawrence, 300 miles north-west of Boston in New England: W. long. 74° N. lat. 47° 35'.

Queen, a woman who holds a crown singly.

The title of queen is also given by way of courtesy to her that is married to a king, who is called by way of distinction queen-consort; the former being termed queen-regent. The widow of a king is also called queen, but with the addition of dowager.

Queen's County, a county of Ireland, bounded by King's county, on the north; by Kildare, on the east; by Kilkenny, on the south; and by the province of Munster, on the west.

Queen's Ferry, a town of Scotland, on the south side of the river Forth, ten miles west of Edinburgh.

Queenborough, a borough town on the isle of Sheppey, in Kent, twelve miles north-west of Canterbury. It tends two members to parliament.

Quercus, in botany, a genus of the monoecia polyandria class. The calyx of the male has five segments; it has no corolla; and the stamens are from five to ten. The calyx of the female is one entire, rough leaf; it has no corolla; the stamens are from two to five; and the seed is ovated. There are 14 species, only one of them, viz. the robur, or common oak, a native of Britain.

Quercy, the south-east division of the province of Guienne, in France, have Limousin on the north, and Languedoc on the south.

Queria, in botany, a genus of the triandria trigynia class. The calyx consists of five leaves; it has no corolla; and the capsule has one cell and one seed. There are two species, none of them natives of Britain.

Question, in logic, a proposition proposed by way of interrogation. See Logic.

Questor, in Roman antiquity, an officer who had the management of the public treasure.

The questrorship was the first office any person could bear in the commonwealth, and gave a right to sit in the senate.

At first there were only two; but afterwards two others were created, to take care of the payment of the armies abroad, of the selling plunder, booty, &c. for which purpose they generally accompanied the consuls in their expeditions: on which account they were called peregrini, as the first and principal two were called urbani.

The number of questors was afterwards greatly increased: They had the keeping of the decrees of the senate, and hence came the two offices of questor principis, or augusti, sometimes called candidatus principis, whose office resembled in most respects that of our secretaries of state; and the questor palatii, answering in a great measure to our lord chancellor.

Queue, in heraldry, signifies the tail of a beast; thus if a lion be borne with a forked tail, he is blazoned doublequeued.

Quick, or Quickest Hedge, among gardeners, denotes all live hedges, of whatever sort of plants they are composed, to distinguish them from dead hedges; but in a
QUINQUAGENARIUS, in Roman antiquity, an officer to the house of Austria: E. long. 18°, N. lat. 48°.

RAAB, a city of Lower Hungary, situated at the confluence of the rivers Danube and Raab, and subject

QUANTICUS, in botany. See Potentilla.

QUINQUAGYNIUM, in Roman antiquity, a magistrature in the colonies and municipal cities of that empire, who had much the same office as the ædile at Rome.
RACK, an engine of torture, furnished with pulleys and cords, &c. for extorting confession from criminals.

RACKED wines. See to draw them off from their lees, after their having stood long enough to clear and settle, from whence the liquor runs through a small wooden pipe. This liquor is more intoxicating than brandy distilled from wine.

To Rack wines, &c. to draw them off from their lees, after their having stood long enough to clear and settle. Hence physicians talk much of a radical moisture.

Hence rack-vintage is frequently used for the second voyage our wine-merchants used to make into France for racked-wines.

RACKOON, in zoology. See Viverra.

RACKS, in building, are pieces of timber, which stand upright, and most in use. It is made of the bottom bunch of the cocoa-tree: for which purpose they tie the bunch, situated under the head. There are nine species, one of which is the torpedo, or crap-fish, found in the Mediterranean and Persian Gulf. When touched, it defends itself by a tremulous motion, which benumbs any animal which attempts to injure it.

RAJANIA, in botany, a genus of the dicotyledonous plants, the remains of which are found in the ruins of those who ruled there before the Moguls. Some of the rajas are said to preferve their independence, especially in the mountainous parts; but most of them pay an annual tribute to the Mogul.

RAJA, the title of the Indian black princes, the remains of whose who ruled there before the Moguls. Some of the rajas are paid to preserve their independency, especially in the mountainous parts; but most of them pay an annual tribute to the Mogul.

RAJA, in ichthyology, a genus belonging to the order of amphibian nates. There are five species, one of which is the torpedo, or crap-fish, found in the Mediterranean and Persian Gulf. When touched, it defends itself by a tremulous motion, which benumbs any animal which attempts to injure it.

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Mr. Derham accounts for the precipitation hence, that the vehicule being full of air, when they meet with a colder air than that they contain, their air is contracted into a less space; and consequently the watery fluid rendered thicker, so as to become heavier than the air, &c.

Others allow the cold a part in the action, and bring in the winds as sharers with it: indeed, it is plain, that a wind, blowing against a cloud, will drive its vehicule upon one another, by which means several of them coalescing, will be enabled to deflect; and the effect will be still more considerable if two opposite winds blow towards the same place. Add to this, that clouds already formed, happening to be aggravated by fresh accretions of vapour continually ascending, may thence be enabled to descend.

According to Rohault, the great cause of rain is the heat of the air; which, after continuing for some time near the earth, is at length carried up on high by a wind, and there thawing the frozen vehicule, reduces them into drops; which, coalescing, descend.

Others, as Dr. Clarke, &c. ascribe this descent of the clouds rather to an alteration of the atmosphere than of the vehicule; and suppose it to arise from a diminution of the elastic force of the air. This elasticity, which depends chiefly or wholly on the terrene exhalations, being weakened, the atmosphere sinks under its burden, and the clouds fall.

Now the little vehicules, being once upon the descent, will pervert therein, notwithstanding the increase of resistancy they every moment meet with. For as they all tend toward the centre of the earth, the farther they fall, the more coalitions will they make; and the more coalitions, toward the centre of the earth, the farther they fall, the more matter will there be under the same surface; and the latter have a latent acidity with the sweetness that renders them much less agreeable.

The battering ram was of two sorts; the one rude and plain, the other compound. The former seems to have been no more than a great beam which the soldiers bore on their arms and shoulders, and with one end of it by main force affailed the wall. The compound ram is thus described by Josephus: it is a vall beam, like the mallet of a ship, strengthened at one end with a head of iron, something resembling that of a ram, whence it took its name.

This was hung by the middle with ropes to another beam, which lay across two posts; and hanging thus equally balanced, it was by a great number of men drawn backwards and pushed forwards, striking the wall with its iron-head.

Plutarch informs us, that Marc Anthony, in the Parthian war, made use of a ram fourscore feet long; and Vitruvius tells us, that they were sometimes an hundred and six, and sometimes an hundred and twenty feet in length; and to this perhaps the force and strength of the engine was in a great measure owing. The ram was managed at one time by a whole century of soldiers; and they being spent, were seconded by another century, so that it played continually without any interruption.

Ram's head, in a ship, is a great block belonging to the fore and main halliards. It has three sheers in it, into which the halliards are put, and in a hole at the end of it are reeved the ties.

Ramadán, a solemn season of fasting among the Mahometans. See Mahometanism.

Ramification, the production of boughs or branches, or of figures resembling branches.

Rammer, an instrument used for driving down stones or piles into the ground; or for beating the earth, in order to render it more solid for a foundation.

Ram of a gun, the gun-flick; a rod used in charging of a gun, to drive home the powder, as also the shot and the
the wad, which keeps the shot from rolling out. See Gunner.

RAMPANT, in heraldry, a term applied to a lion, leopard, or other beast that stands on his hind-legs, and rears up his forefront in the posture of climbing, slewing only half his face, as one eye, &c. It is different from fulant, in which the beast seems springing forward as if making a rally. See Plate CXLVII fig. 6.

RAMPART, in fortification, is an elevation of earth round a place capable of resisting the cannon of an enemy; and formed into bastions, curtains, &c. See Fortification.

RAMSEY, an island in the Irish channel, on the coast of Pembrokefhire: W. long 5° 20', N. lat. 51° 55'.

RAMUS, in general, denotes a branch of anything, as of a tree, an artery, vein, &c.

RANA, the frog, in zoology, a genus belonging to the class of amphibia reptilia. The body is naked, furnished with four feet, and without any tail. There are 17 species. Frogs undergo a very strange metamorphosis. When they first issue from the eggs, they appear in a roundish form, with a long tail, and are then denominated tadpoles. After continuing in this state for several weeks, the tail begins to mortify and fall off gradually, the feet at the same time springing as gradually out of the body, till they assume the complete form of frogs.

RANCHIERA, a port-town of Terra Firma, situated in W. long. 72°, N. lat. 10° 34'.

RANCID, denotes a fatty ferment that becomes rank or mulli, or has contracted an ill smell by being kept close.

RANGE, in gunnery, the path of a bullet, or the line it describes from the mouth of the piece to the point where it lodges. See Gunnery.

RANGIFER, the rein-deer. See Curvis.

RANK, the order or place allotted a person, suitable to his quality or merit.

RANKING OF CREDITORS, in Scots law. See Law, Tit. xix. 13.

RANSOM, a sum of money paid for the redemption of a slave, or for the liberty of a prisoner of war. In our law-books, ransom is also used for a sum paid for the pardon of some great offence, and to obtain the offender's liberty.

RANULA, a tumour under the tongue, which like a ligature hinders a child from speaking or sucking.

RANUNCULUS, in botany, a genus of the polyandria class. The calix consists of five leaves, and the corolla of five petals, with a melliferous pore in the corolla of five petals, with a melliferous pore in the claw of each; and the seeds are naked. There are 38 species; 11 of them natives of Britain.

RAPID, a city of the hither India, situated in the province of Bengal: E. long. 23°, N. lat. 6° 22'.

RAPAN, the rat-tails, or Arrests, in the manege, signify hard callous swellings upon the hinder legs under the hough, running along the sinew.

RAPHIDIA, in zoology, a genus of insects belonging to the order of neuroptera. The head is depressed and hony; it has two teeth, four pappi, and three hemmata; the wings are deflected; the feelers are cylindrical, and of the length of the thorax; and the tail of the female is furnished with a lax bended bristle. There are three species.

RAPIER, formerly signified a long old-fashioned broad sword, such as those worn by the common soldiers; but it now denotes a small sword, as contradistinguished from a back-sword.

RAPINE, in law, the taking away another's goods, &c. openly and by violence.

RAPPANNOCK, a large navigable river which rises in the mountains west of Virginia, and discharges itself into the bay of Chesapeake.

RAPTURE, an ecstasy, or transport of mind. See Ecstasy.

RARE, in physics, stands opposed to dense; and denotes a body that is very porous, whose parts are at a great distance from one another, and which contains little matter under a large bulk.

RAREFACTION, in physics, the act whereby a body is rendered rare; that is, brought to possess more room, or appear under a larger bulk without accession of any new matter.

RASEBURG, a port-town of Sweden, in the province of Finland, and territory of Nyland, situated on the gulf of Finland: E. long. 23°, N. lat. 60° 22'.

RASSTAT, the name of two towns of Germany: one in the circle of Bavaria and archbishopric of Salzburg, situated on the river Ens, thirty-five miles south of the city Ens; another in the circle of Swabia and marquisate of Baden, situated on the east side of the river Rhine, twenty-one miles south-west of Philipburg.

RAT, in zoology. See Mus.

RAT-TAILS, or ARRESTS, in the manege, signify hard callous swellings upon the hinder legs under the hough, running along the sinew.

RATAFIA, a fine spirituous liquor, prepared from the kernels, &c. of several kinds of fruits, particularly of cherries and apricots.

Ratafia of cherries is prepared by bruising the cherries, and putting them into a vessel wherein brandy has been long kept; then adding to them the kernels of cherries, with straw-berries, figs, cinnamon, white pepper, nutmeg, cloves; and to twenty pound of cherries, ten quarts of brandy. The vessel is left open ten or twelve days, and then stopped close for two months before it be tapped. Ratafia of apricots is prepared two ways, viz. either by boiling the apricots in white wine, adding to the liquor an equal quantity of brandy, with figs, cinnamon, mace, and the kernels of apricots; infusing the whole for eight or ten days, then straining the liquor, and putting it up for use: Or else by infusing the apricots cut in pieces in brandy, for a day or two, palling it through a straining bag, and then putting in the usual ingredients.
RATE, a standard or proportion, by which either the quantity or value of a thing is adjusted. 

RATE of a ship at warp, is its order, degree, or distinction, as to magnitude, burden, &c. 

RATEEN, in commerce, a thick woolen stuff, quilted, woven on a loom with four treddles, like ferges, and other stuffs, that have the whale or quilting. There are some rateens drefled and prepared like clothes; others left simply in the hair; and others where the hair or knop is friz'd. Rateens are chiefly manufactured in France, Holland, and Italy, and are mostly used in linings. The frize is a sort of coarse rateen, and the drugget is a rateen half linnen half woolen. 

RATIFICATION, an act approving off, and confirming something done by another in our name. 

RATIO, in arithmetic and geometry, is that relation of one from the quantity of another, without the intervention of a third. See Arithmetic, Algebra, and Geometry. 

RATIFICATION, the act of reasoning. See Reasoning. 

RATION, in the army, a portion of ammunition, bread, drink, and forage, distributed to each soldier in the army, for his daily subsistence. &c. The horse has rations of hay and oats, when they cannot go out to forage. The rations of bread are regulated by weight. The ordinary ration of a foot-folder is a pound and a half of bread per day. The officers have several rations according to their quality and the number of attendants that they are obliged to keep. When the ration is augmented on occasions of rejoicing, it is called a double ration. The ships crews have also their rations or allowances of biscuit, pulse, and water, proportioned according to their rank. 

RATIONAL, reasonable. See Reason. 

RATIONAL, is also applied to integral, fractional, and mixt numbers: thus we say rational fraction, rational integer, and rational mixt number. 

RATIONALISATION, a solution or account of the principles of some opinion, action, hypothesis, phenomenon, or the like. 

RAITPOR, a town of Bohemia, in the duchy of Sileia, situated on the river Oder, sixteen miles north-east of Tropau. 

RAITPOR, is also a city of bitter India, capital of the province of Malwa, situated E. long. 80°, N. lat. 25°. 

RATISBON, a city of Germany, in the circle of Bavaria, situated at the confluence of the rivers Danube and Regen, in E. long. 12° 5', N. lat. 49°. This is a free imperial city, and has the assembly or diet of the states of the empire meets. 

RATLINES or, as the seamen call them, Ratlines, those lines which make the ladder steps to go up the hatches and portholes, hence called the ratlines of the thords. 

RATTLE SNAKE, See Crotaulus. 

RATTLE SNAKE FOOT. See Polyomol. 

RAVA, a city of Great Poland, capital of the Palatinate of Rava, situated fifty miles south-east of Warsaw. 

RAVELIN, in fortification, was anciently a flat battery, placed in the middle of a curtin; but now a detached work composed only of two faces, which make a flat 

angle, without any flanks, and raised before the curtin on the counterescarp of the place. See Fortification. 

RAVEN, in ornithology. See Corvus. 

RAVENGLAS, a port-town of Cumberland, situated on the Irish Channel, thirty-eight miles south-west of Carlisle. 

RAVENNA, a city of Italy, in the pope's territories, capital of the province of Romagna, situated E. long. 13°, N. lat. 42° 30'. 

RAUVOLFIA, a genus of the pentandria monogynia class. The berry contains two seeds. There are two species; both natives of America. 

RAY, in optics, a beam of light, emitted from a radiant or luminous body. See Optics. 

RAYLEIGH, a market-town of Essex, ten miles south-east of Chelmsford. 

RAYONANT, or Cross Rayonant, in heraldry, one of the tinctures used in the escutcheon, as represented in Plate CXLVII. fig. 7. 

RAZOR, a well known instrument used by surgeons, barbers, &c. for shaving off the hair from various parts of the body. 

RAZOR-BILL, in ornithology. See Alca. 

REACTION, in physiology, the resistance made by all bodies to the action or impulse of others that endeavour to change its state whether of motion or rest. See Mechanics. 

READING, a borough town in Berkshire, situated forty miles west of London, near the confluence of the river Kent and Thames; it sends two members to parliament. 

REAL, is applied to a being that actually exists; in which something done by another in our name. 

REAL, or Credus, in stock, a diminutive of rius, thing, or knap is friz'd. Rateens are chiefly manufactured in France, Holland, and Italy, and are mostly used in linings. The frize is a sort of coarse rateen, and the drugget is a rateen half linnen half woolen. 

REALM, a country which gives its head, or governor, the denomination of a king. 

REALMONT, a town of France, in the province of Languedoc, situated thirty-two miles north-east of Tholouse. 

REAL, a term frequently used in composition, to denote something behind or backwards, in respect of another, in opposition to van: thus, in a military sense, it is used for the hind part of an army, in opposition to the front. 

REASON, a faculty or power of the mind, whereby it 

distin-
RECIPROCAL, in general, something that is mutual, or common to both.
RECIPIENT, the name with a receiver.

Reciprocal terms, among logicians, are those which have the same signification; and consequently are convertible, or may be used for each other.

RECEIVER, in heraldry, a diminution or abatement of the bearing of the coat of arms.
REBEL, a traitorous taking up of arms against the king by his own natural subjects, or those formerly subdued.
REBUS, in enigmatical representation of some name, or by using figures or pictures instead of words, or parts of words. Camden mentions an instance of this absurd kind of wit in a gallant, who expressed his love to a woman, named Rose Hill, by painting in the border of his gown a rose, a hill, an eye, a leaf, and a well; which, in the style of the rebus, reads, Rose Hill, I love well. This kind of wit was long practised by the great, who took the pains to find devices for their names. It was, however, ridiculed by Ben Jonson, in the humorous delineation of Abel Drummer's device, in the Alchemist; and by the Spectator, in the device of Jack Newberry, at which time the rebus, being raised to sign-posts, was grown out of fashion at court.
REBUTTER, in law, the defendant's answer to the plaintiff's surriferorder, in a cause depending in the court of chancery, &c.

RECAPITULATION, a summary, or a concise and remanent enumeration of the principal things inferred in the preceding discourse, whereby the force of the whole is collected into one view.
RECEIVER, in usury, a plain receipt for containing the thing on which an interest is computed; or the part of the interest computed.
RECOPTACULUM. See Anatomy, p. 282.
RECHABITES, a kind of religious order among the ancient Jews, instituted by Josiah the son of Rechab, comprehending only his own family and posterity. They are under the same three things: first, not to drink wine; secondly, not to build any houses, but to dwell in tents; and thirdly, not to own any corn, or plow-ivines. These rules the Rechabites observed with great fidelity.

RECIPE, in medicine, a prescription or remedy, to be taken by a patient; it is called a receipt, always beginning with the word receipt, i.e., recipe, which is generally denoted by the abbreviation R. Dr.
RECIPIENT, the name with a receiver.
RECPROCAL, in general, something that is mutual, or which is returned equally on both sides; or that affects both parties alike.

RECPROCAL TERMS, among logicians, are those which have the same signification; and consequently are convertible, or may be used for each other.

RECPROCAL FIGURES, in geometry, those which have the antecedents and consequents of the same ratio in both figures. See Geometry.
RECUITATIVO, in music, a kind of singing that differs but little from ordinary pronunciation, such as that in which the several parts of the liturgy are recited in cathedral; or that wherein the actors commonly deliver themselves on the theatre at the opera, when they are to express some sensoir passion, to relate some event, or reveal some design.

RECKONING, or a ship's reckoning. See Navigation.

RECLAMBUTER, in heraldry, a diminution or abatement, or redaction, in commerce, & term much used at Amsterdam, for an abatement in the price of several commodities, when the buyer instead of taking time advances ready money.

REBATE, or rebatement, in commerce, a term much used at Amsterdam, for an abatement in the price of several commodities, when the buyer instead of taking time advances ready money.

REBATEMENT, in law, the defendant's answer to the plaintiff's answer, i.e., to set forth against the accuser upon the same fact.
RECLAIM, in heraldry, a diminution or abatement.
RECRUITS, in military affairs, new-raised soldiers, designed to supply the place of those who have lost their lives in the service, or are disabled by age or wounds.

RECONNOITRE, in war, to view and examine the state and situation of things.
RECORD, an authentic testimony in writing, contained in rolls of parchment, and preferred in a court of record.
RECORDE, a person whom the mayor and other magistrates of a city or corporation associate to them, for their better direction in matters of justice, and proceedings in law; on which account this person is generally a counsellor, or other person well skilled in the law.

The recorder of London is chosen by the lord mayor and aldermen; and, as he is held to be the mouth of the city, he delivers the judgment of the courts therein, and records and certifies the city-culloms.

RECOUSE ON BILL, in Scots law. See Law, Tit. xx. 12.

RECLAMATION, in chemistry, some superfused matter separated from some other that is useful; in which sense it is the same with scoria, fuses, and excrèments. See Chemistry.

RECRIMINATION, in law, an accusation brought by the accused against the accuser upon the same fact.
RECRUITS, in military affairs, new-raised soldiers, designed to supply the place of those who have lost their lives in the service, or are disabled by age or wounds.

RECTIFICATION, in chemistry, is nothing but the repetition of a distillation or sublimation several times in order to render the substance pure, finer, and finer from aqueous or earthy parts.
RECTIFIER, in navigation, an instrument consisting of two parts, which are two circles one of which has its center in the other, and is fastened together in their centers, that they represent two compasses, one fixed, the other movable; each of them divided into the thirty-two points of the compass, and those hundred and sixty degrees, and numbered both ways, from the north and the south, ending at the east and west, in ninety degrees.

The first compass represents the horizon, in which the
the north and all the other points of the compass are fixed and immovable.

The moveable compass represents the mariners compass, in which the north and all other points are liable to variation.

In the centre of the moveable compass is fastened a silk thread, long enough to reach the outside of the fixed compass. But, if the instrument be made of wood, there is an index instead of the thread.

Its use is to find the variation of the compass, to rectify the course at sea; having the amplitude or azimuth given.

**Rectifier**, in the distillery, the person whose employment it is to take the coarse malt-spirit of the malt-filler, and redistil it to a finer and better liquor.

**Rectilinear**, in geometry, right-lined: thus figures whose perimeter consists of right lines, are said to be rectilinear.

**Rectitude**, in philosophy, refers either to the act of judging or of willing: and therefore whatever comes under the denomination of rectitude is either what is true, or what is good; these being the only objects about which the mind exercises its two faculties of judging and willing.

**Moral rectitude**, or uprightness, is the judging and purifying those things which the mind, upon due inquiry and attention, clearly perceives to be good; and avoiding those that are evil.

**Rector**, a term applied to several persons whose offices are very different: as, 1. The rector of a parish is a clergyman that has the charge and cure of a parish, and possesses all the tythes, &c. 2. The same name is also given to the chief elective officer in several foreign universities, particularly in that of Paris. 3. Rector is also used in several convents for the superior officer who governs the houfe: and the Jesuits give this name to the superiors of each of their houses as are either seminaries or colleges.

**Rectory**, a parish-church, parsonage, or spiritual living, with all its rights, tythes, and glebes.

**Rectum**, in anatomy, the third and last of the large intestines or guts. See Anatomy, p. 261.

**Rectus**, in anatomy, a name common to several pair of muscles, so called on account of the slantings of their fibres. See Anatomy, Part II.

**Recurrents**, in anatomy, a name given to several large branches of nerves sent out by the par vagum from the upper part of the thorax to the larynx.

**Recuvirostra**, in ornithology, a genus belonging to the order of grallse. The beak is sublated, bent back, sharp and flexible at the point; the feet are webbed, and furnished with three toes. But there is but one species, viz. the avocetta, a native of the southern parts of Europe. It migrates into Italy, and is seldom seen in England charged with double taxes, not merely as Romanists but as recusants.

In a moral sense, to redress grievances is to reform and remove them.

To redress a flag, among hunters, is to put him off his changes.

**Redruth**, a market-town of Cornwall, situated fifty miles south-west of Launceston.

**Redoubt**, in fortification, a small square fort, without any defence but in front, used in trenches, lines of circumvallation, or the end that one part may flank or defend another. It is called faw-work and indented-work.

**Redintegration**, in the civil law, the act of restoring a person to the enjoyment of a thing whereof he had been illegally dispossessed.

**Redoubt**, in fortification, a small square fort, without any defence but in front, used in trenches, lines of circumvallation, or the end that one part may flank or defend another. It is called faw-work and indented-work.

**Redressing**, the rectifying or setting any thing straight again.

**Red Sea** separates Asia from Africa.

**Reddell** separates Little Russia.

**Red Sea**, or Little Russia, a province of Poland, bounded by the province of Polefsia, on the north; by Volhynia and Podolia on the east; by the Carpathian mountains, which divide it from Transylvania and Hungary, on the south; and by the province of Little Poland, on the west; being two hundred miles long, and one hundred broad.

**Red Sea** separates Asia from Africa.

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RE-EXCHANGE, in commerce, a second payment of the price of exchange, or rather the price of a new exchange upon a bill of exchange that comes to be protested and to be refunded the bearer by the drawer or indorser.

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REFER, in the language of jargon, the putting a rope through a block: hence pull a rope out of a block, is called unreeling.

RED, in the manufacories, the winding of thread, silk, cotton, or the like, into a skein, or upon a bottom, to prevent its entangling. It is also used for the charging or discharging of bobbins or quills, to use them in the manufacture of different fluffs, as thread, silk, cotton, &c. Reeling is performed different ways, and on different engines.

RE-EXCHANGE, in commerce, a second payment of the price of exchange, or rather the price of a new exchange upon a bill of exchange that comes to be protested and to be refunded the bearer by the drawer or indorser.

REFERENCE, in writing, &c. a mark relative to another similar one in the margin, or at the bottom of the page, where something omitted in the text is added, and which is to be inserted either in reading or copying.

REFINING, in general, is the art of purifying a thing; which is to be inserted either in reading or copying.

REFLEXION, the return or regressive motion of a moving body, occasioned by some obstacle which hindered it from pursuing its former direction.

REFLECTION is also used, figuratively, for an operation of the mind; whereby it turns its view backwards as it were upon itself, and makes itself and its own operation the object of its disquisition; and by contemplating the manner, order, and laws which it observes in perceiving ideas, comparing them together, reasoning, &c. it frames new ideas of the relations discovered therein. See Logic, and Metaphysics.

REFINING of gold. See Chemistry, p. 129.

REFINING of silver. See Chemistry, p. 130.

REFLECTION, the return or regressive motion of a moving body, occasioned by some obstacle which hindered it from pursuing its former direction. See Optics.

Reflection is also used, figuratively, for an operation of the mind; whereby it turns its view backwards as it were upon itself, and makes itself and its own operation the object of its disquisition; and by contemplating the manner, order, and laws which it observes in perceiving ideas, comparing them together, reasoning, &c. it frames new ideas of the relations discovered therein. See Logic, and Metaphysics.

REFLEXION of the fia, the ebbing of the water, or its returning from the shore. See Astronomy, p. 473.

REFORMATION, the act of reforming or correcting an error or abuse in religion, discipline, or the like. The Reformation, so called by way of eminence, is the separation of the Protestants from the church of Rome, in the beginning and towards the middle of the sixteenth century.

REFRACTION, in general, is the deviation of a moving body from its direct course, occasioned by the different density of the medium it moves in; or, it is a change of direction, occasioned by a body's falling obliquely out of one medium into another of a different density. See Optics.

REFRANGIBILITY of light, the disposition of rays to be refracted. See Optics.

REFRIGERATIVE, in medicine, a remedy which refreshes the inward parts, by cooling them, as cyphels, puffers, &c. See Chemistry, p. 62.

REFRIGERATORY, in chemistry a vessel filled with cold water, through which the worm passes in distillations; the use of which is, to condense the vapours as they pass through the worm.

REFUGE, a sanctuary or asylum.

REFUGEES, French Protesants, who, by the revocation of the edict of Nantes, have been constrained to fly from persecution, and take refuge in foreign countries.

REGAL or Royal, something belonging to a king.

REGALE, a magnificent entertainment or treat given to ambassadors, and other persons of distinction, to entertain or do them honour.

It is usual, in Italy, at the arrival of a traveller of eminence, to lend him a regale, that is, a present of sweetmeats, fruit, &c. by way of refreshment.

REGALE, in the French jurisprudence, is a royal prerogative, which consists in enjoying the revenues of bishops during the vacancy of their seats, of presenting to benefices, and of obliging the new bishop to take an oath of fidelity, and to register it in the chamber of accounts. The enjoyment of the fruits of the see is called the temporal regale; and that of presenting to the see, the spiritual regale.

REGALIA, in law, the rights and prerogatives of a king, which, according to civilians, are fixed: viz. 1. The power of judicature; 2. The power of life and death; 3. The power of peace and war; 4. A right to such goods as have no owner, as waifs, estrays, &c. 5. Assentments; and, 6. The coinage of money.

Regalia is also used for the apparatus of a coronation, as the crown, the sceptre with the cross, that with the dove, St. Edward's staff, the globe, and the orb with the crosses, four several swords, &c.

REGALIA, in Scots law. See Law, Tit. xiii. 3.

Lord of Regality, in Scots law. See Law, Tit. iv. 4.

REGARDANT, in heraldry, signifies looking behind; and is used for a lion, or other beast, with his head turned toward its tail.

REGARDER, an ancient officer of the king's forell, sworn to make the regard of the forell every year; that is, to take a view of its limits, to inquire into all offences and defaults committed by the foresters within the forest, and to observe whether all the other officers executed their respective duties.

REGEL, or Rigel, a fixed star of the first magnitude, in Orion's left foot.

REGENERATION, in theology, the act of being born again by a spiritual birth, or the change of heart and life experienced by a person who forsakes a course of vice, and sincerely embraces a life of virtue and purity.

REGENT, one who governs a kingdom during the minority or absence of the king.

In France, the queen mother has the regency of the kingdom during the minority of the king, under the title of queen-regent.

Regent also signifies a professor of arts and sciences in a college, who has a set of pupils under his care; but here regent is generally restrained to the lower classes, as regent of rhetoric, regent of logic, &c. those of philosophy are rather called professors.

REGICIDE.
REGICIDE, king-killer, a word chiefly used with us in speaking of the persons concerned in the trial, condemnation, and execution of king Charles I.

REGIFUGE, a feat celebrated in ancient Rome on the sixth of the kalends of March, in memory of the expulsion of their ancient kings, and particularly of Tarquin's flying out of Rome on that day.

REGIMEN, the regulation of diet, and, in a more general sense, of all the non-naturals, with a view to preserve or restore health. See Medicine.

REGIMENT, in grammar, that part of syntax, or construct which regulates the dependency of words, and the alterations which one occasions in another. See Grammar.

REGIMENT, in war, is a body of men, either horse or foot, commanded by a colonel.

Each regiment of foot is divided into companies; but the number of companies is not always alike; though our regiments generally consist of thirteen companies, one of which is always grenadiers.

Regiments of horse most commonly consist of six troops, but some have nine.

Regiments of dragoons, in time of war, are generally composed of eight troops; and in time of peace, of six.

REGION, in geography, a large extent of land, inhabited by many people of the same nation, and inclosed within certain limits or bounds.

REGISTER, a public book in which is entered and recorded memoirs, acts, and minutes, to be had recourse to occasionally, for knowing and proving matters of fact.

Register ships, in commerce, are vessels which obtain a permission either from the king of Spain, or the council of the Indies, to traffic in the ports of the Spanish West-Indies; which are thus called, from their being registered before they set sail from Cadiz, for Buenos Ayres.

Registers, in chemistry, are holes, or chinks with stoppers, contrived in the sides of furnaces, to regulate the fire; that is, to make the heat more intense, or, by opening them to let in the air, or keeping them close to exclude it.

REGISTRY, the office, books, and rolls, in which the proceedings in chancery, or any spiritual court, are registered.

REGRATOR, or Regrater, in law, formerly signified one who bought wholesale, or by the great, and sold again by retail; but the term is now used for one who buys any wares or victuals, and sells them again in the same market, or fair, or within fifteen miles round it. See Forstalling.

REGULAR, denotes any thing that is agreeable to the rules of art: thus, we say a regular building, verb, &c.

A regular figure, in geometry, is one whose sides, and consequently angles, are equal; and a regular figure with three or four sides, is commonly termed an equilateral triangle, or square; as all others with more sides are called regular polygons.

Regular, in a monastery, a person who has taken the vows; because he is bound to observe the rules of the order he has embraced.

REGULATION, a rule or order preferred by a superior, for the proper management of some affair.

REGULATOR of a watch, the small spring belonging to the balance; serving to adjust its motions, and make it go faster or slower. See Watch.

REGULUS, in ornithology. See Motacilla.

REGULUS, in chemistry, an imperfect metallic substance, that falls to the bottom of the crucible, in the melting of ores or impure metallic substances. See Chemistry, paffin.

REHABILITATION, in the civil and the canon law, the restoring a delinquent to his former condition.

REHEARSAL, in music and the drama, an essay or experiment of some composition, generally made in private, previous to its representation or performance in public, in order to render the actors and performers more perfect in their parts.

REIN-DEER, in zoology. See Cervus.

REINS, in anatomy. See Anatomy, p. 268.

REJOINDER, in law, is the defendant's answer to the plaintiff's replication or reply. Thus, in the court of chancery, the defendant puts in an answer to the plaintiff's bill, which is sometimes also called an exception; the plaintiff's answer to this is called a replication; and the defendant's answer to that a rejoinder.

REITERATION, the act of repeating a thing, or doing it a second time.

RELAPSE, a falling again into a danger, evil, or disease, from which a person has escaped.

RELATION, the mutual respect of two things, or what each is with regard to the other. See Metaphysics.

RELATION, in geometry. See Ratio.

RELATION is also used for analogy. See Analogy.

RELATIVE, something relating to, or respecting, another.

RELATIVE TERMS, in logic, are words which imply a relation: such are master and servant, husband and wife, &c.

RELAXATION, in medicine, &c, the act of loosening or slackening, or the looseness and slackness of the fibres, nerves, muscles, &c.

RELAY, a supply of horses placed on the road, and appointed to be ready for a traveller to change, in order to make the greater expedition.

RELEVANCY, in Scots law. See Law, Tit. xxxiii, 48.

RELIERS, in the Romish church, the remains of the bodies of saints or martyrs, and the instruments by which they were put to death, devoutly preserved, in honour to their memory; kissed, revered, and carried in procession.

RELICT, in law, the same with widow.

RELIEVO, or Relief, in sculpture, &c, is the projection or standing out of a figure; which arises prominent from the ground or plan on which it is formed; whether that figure be cut with the chisel, moulded, or cast.

There are three kinds or degrees of relief, viz. alto, baso, and demi reliefo. The alto-relievo, called also haut-relief, or high relief, is when the figure is formed after nature, and projects as much as the life. Baso-relievo, bas-relief, or low relief, is when the work is raised but a little from the ground, as in medals; and the frontispieces of buildings; and particularly in the histories, festoons, foliages, and other ornaments of friezes. Demi-relievo is when one half of the figure rises from the plan.
When, in a basse-relievo, there are parts that stand clear out, detached from the rest, the work is called a demi-basse.

RELIGION, OR THEOLOGY.

I. To know God, and to render him a reasonable service, are the two principal objects of religion. We know but little of the nature of bodies; we discover some of their properties, as motion, figure, colours, &c. but of their essence we are ignorant: we know still much less of the soul; but of the essence or nature of God, we know nothing: it is the prerogative of the Supreme Being alone to comprehend his own essence; all the efforts that we can make to attain that knowledge, are arrogant and ineffectual; it is foreign to the properties of the limited spirit: but our destiny is that of a man, and our desires are those of a God. In a word, man appears to be formed to adore, but not to comprehend, the Supreme Being.

II. We may say, however, with Virgil, Jovis omnia pleme; God manifests his existence, not only to the internal sensations of our minds, but in every object that surrounds us in the whole frame of nature; and if we cannot comprehend the Supreme Being by our senses, we may discover his attributes by our reason, almost as clearly as we distinguish the properties of matter, and many other objects: and this knowledge is sufficient for us. The end of every order of science is some temporal happiness: theology alone proposes an eternal felicity; its object therefore differs from all other sciences, as the age of threescore and ten differs from eternity. We cannot wonder therefore, that all the inhabitants of the earth, from the time of the creation, have made it their principal study, and have exerted all their abilities in the cultivation of it: we ought much rather to be astonished that they have been so slow to arrive at this knowledge is sufficient for us. The end of every order of science is some temporal happiness: theology alone proposes an eternal felicity; its object therefore differs from all other sciences, as the age of three-score and ten differs from eternity. We cannot wonder therefore, that all the inhabitants of the earth, from the time of the creation, have made it their principal study, and have exerted all their abilities in the cultivation of it: we ought much rather to be astonished that they have been so slow to arrive at this

III. From the first knowledge that we have of the world, that is to say, for about five thousand years past, men have blindly searched after the idea of the true God; and by the weakness of their discernment, they have fallen into a thousand errors. Paganism at first covered the whole earth, except that family alone which became the flock of the Jewish people: this paganism among different nations had different mixtures of idolatry. Moses first made known to the Hebrews the true God, and prescribed him the worship: his religion, however, was not adopted by any other people, not even by their neighbours. Jesus Christ appeared upon the earth, abolished a part of the Judaic law, reformed the religion of Moses, taught his divine doctrines, and offered himself as a sacrifice for the salvation of mankind. His gospel made a happy progress over all Europe, that is, over the then known part of the earth. Some time after, Mahomet arose in the east, and preached a religion that he had compounded of the Jewish and Christian, and of his own ideas. Lastly, came Luther and Calvin, who reformed the errors which, according to them, had been introduced into Christian under the reigns of the popes; and gave the idea of what is called the Protestant Religion. Confucius had taught the Chinese, and Zoroaster the Indians, religions drawn partly from philosophy, and partly from paganism; but the extent of these was very confined. All these religions, and their different sects, had their theology, their priests, their ceremonies, their triumphs, and even their martyrs.

IV. We shall not speak here of religions that are extinct, or that yet exist, but at a distance far from us: we shall treat only of the Christian theology, which teaches us to know God, by revelation and by the light of reason, so far as it is possible for the weakness of the human mind to comprehend that incomprehensible Being. The knowledge of the true God is indeed of little utility to man, unless he can suppose that there is some connection or relation between that Supreme Being and himself. Now it is from these connections or relations that are derived the necessity of the knowledge of the true God, and of the true manner in which he is to be worshipped: and this it is that forms the Christian theology; of which we shall now give the analysis.

V. To ascend by a chain of reasoning from things visible to things invisible, from palpable to impalpable, from terrestrial to celestial, from the creature even up to the Creator, is the business of theology: it is not surprising, therefore, that the union of many doctrines is necessary completely to form such a science. To understand, and properly to interpret the scriptures or revelation, demands not less sagacity than affinity. The gift of persuasion is also essential to the ministers of the gospel. And lastly, the civil government has committed to their care certain functions of society, which relate, or seem to relate, either to the doctrines or morality of the gospel. They assemble, for example, in bodies to form consistories; they judge in matrimonial cases; they carry consolation and hope to the souls of the sick; they prepare for death those criminals which justice sacrifices to public safety; they take upon themselves the charge of Ephor, with the inspection of some pious foundations; they distribute alms; they administer the sacraments, &c.

VI. To discharge fully so many duties, the theologian has need, 1. Of several preparatory studies; 2. Of some theoretic sciences; and, 3. Of many doctrines which have for their object his ministerial office. The first are,

1. The languages; and among these,
   (a) His native language, in which he is to preach and exercise his ministry, and with which he ought to be perfectly acquainted.
   (b) The Latin language, which is the language of the learned world in general.
   (c) The Greek language, in order to understand the New Testament.
   (d) The Hebrew language, of which the Talmudian and Rabbinical idioms are a part.
   (e) The Arabic language.
   (f) The Syriac language.
of the Dogmatic.

I. Under the general term of dogmatic, we comprehend that part which the different writers on theology have called sometimes theorems, sometimes the pulmonary, and sometimes dogmatic, &c. The term dogmatic appears to us the most general, and the most just, to express the subject that we intend, as it comprehends an entire system of all the dogmas or tenets that each religion professes; whether it teach these dogmas by the way of thesis, as articles of faith; by public lecture; by catechising; or in any other manner whatever.

II. Every positive religion must, naturally, have a system of certain points of doctrine to propound to its followers; otherwise, each one would form a particular system according to his own fancy; there would be as many different religions as there are individuals on the earth, and each society would consist of a confused mass of fantastic opinions; as the different modes of thinking, and the different degrees of discernment are varied and compounded by mankind to infinity; but truth, on the contrary, is uniform and invariable.

III. The Christian religion is as compound in its dogmas, as it is simple in its moral principle. It includes, 1. The dogmas founded on the lights of reason; 2. Those drawn from the Old Testament, and the law of Moses; 3. Those taken from the New Testament, and the doctrine of Jesus Christ; 4. Those that the fathers of the church have drawn from the Holy Scriptures; 5. Those that the church, under the New Testament, has prescribed to Christians, by ecumenical and other councils assembled in different ages; 6. The dogmas that the popes, in quality of heads of the church, have established by their bulls: and to these must be added, on the part of the protestants, 7. The dogmas which the reformers, especially Luther and Calvin, have taught; 8. The decisions of synods; and lastly, the tenets that are maintained by the different sects, as Socinians, Anabaptists, Quakers, &c. Each of these particular religions or sects pretend to support their dogmas both by reason and revelation: we do not here offer a work of controversy, and are very far from attempting to determine on which side truth and reason are to be found.

IV. Our zeal, however, for the Christian religion in general, which we regard as perfectly divine, and as the only religion adapted to promote the happiness of mankind in this world, and to secure it in the next, and the desire we have that it may endure to the end of time, compels us to make in this place one important reflection; which is, that simplicity is ever an essential attribute of perfection, as complexity is of imperfection. Now, it cannot be denied, without doing violence to truth, that among the different dogmas of which we have been speaking there are several that seem to be founded on speculations very abstruse, on subtleties very intricate, and on interpretations very ambiguous. God certainly never intended that all men should be theologians; he has not given them his divine word to be the cause of discord among men, nor that they should pass their whole lives
lives in a painful search after objects of belief; and articles
of faith; and that they should forego, in that pursuit, the
necessary offices of life, and their duties as citizens. The
dogmas, then, essentially necessary to the welfare of man-
kind, ought to consist of a small number, and to bear the
marks of simplicity and perspicuity; without which they must
be imperfect, and consequently the work of man. Our in-
tention, in making this remark, is, to extend our voice, if
it be possible, even to posterity, whom we would conjure
not to injure our religion, so holy and so admirable, by a
multiplicity of dogmas. It is necessary, however, that the
divine, who makes it his study and his profession, should be
thoroughly acquainted with the theory of this science, in
order that he may be able to instruct the sincere Christian,
and to explain the nature of each particular dogma, as well
as the solidity of its proofs; and to this it is that the study
of the dogmatic leads; of which we shall now continue the
analysis.

V. The dogmatic is then nothing but a succinct exposition
of all the dogmas of the Christian religion, in a natural
and philosophical order. By the word philosophic, we do not
here precisely mean the method of mathematicians, in the
manner the late Mr. Wolff has applied it to philosophy; e-
every subject is not capable of a demonstration so exact and
rigid; but a regular order is required in the arrangement of
the general system, and a connection to be preferred in the
several matters that form it: the definitions should be ju-
t; the divisions exact; the arguments solid; the proofs
clear; the citations conclusive; the examples striking; and,
in a word, every thing should be added that appertains to
so important a discipline.

It is very essential, moreover, in the dogmatic, at the
beginning of each thesis, to explain the several terms that
are peculiar to it, and that have been established in treating
of theology, to draw from each definition certain axioms, and
from thence to form propositions, and to illustrate them by
solid reasoning. Lastly, we should not neglect, in such a
system, to make use of the expressions used in the symbolic
books that have been received by the whole Christian church,
and which cannot be rejected or altered, without causing a
confusion in our ideas, and in the general system of the
Christian religion. But before we make the least advance
in the study of Christian theology, it is indispensably nec-
necessary to examine the proofs by which the truth, the authen-
ticity, and the divinity of the sacred and canonical books are
established; for this is the foundation of all the dogmas;
and the axis on which its whole doctrine turns.

VI. The systematic part of the Christian religion, among
the number of its dogmas or theses, has three principal,
from which all the rest are derived, and which form the
basis of its whole doctrine:

1. The existence of one God in three persons.
2. The necessity of a Mediator or Redeemer.
3. The real appearance of the Mediator or Messiah on
the earth.

Whoever writes, professes, or teaches the dogmatic,
should be, above all things, careful well to establish these
important truths; to convince them by the strongest and most
evident proofs, drawn partly from the lights of reason,
and partly from revelation; and be that all facility with which
all other theses flow from, and how easy it will be
to prove them by, these.

VII. The infinite variety that is found among mankind
in their manner of thinking, and in their method of treating
subjects; the frequent changes that have happened in the
exterior form of philosophy, and in the method of treating
it; the oppositions that have been raised at all times aga-

* Thos. of Du Pin and William Cave are most celebrated.
to prove the existences and the attributes of the Supreme Being; the necessity of the creation of the universe by Almighty God, in opposition to every other possible manner of its being produced: it furnishes, moreover, plausible conjectures concerning the intention of the Almighty in creating this world; it proves the necessity of a perpetual power to preserve it; it supposes, that, as God could not produce anything that was not perfect in its kind, he could not have created man as he now is; it vindicates the conduct of the Supreme Being, in appointing chastisements for transgressions, by shewing that moral evil was not introduced into the world by absolute necessity, but by the abuse of liberty, the most noble prerogative of the human soul; it determines the necessity of a Mediator; it furnishes arguments for the belief of the immortality of the soul, and of a future state that has a relation to the moral actions of this life; and lastly, it inspires a love of God as a Being of sovereign perfection, a gratitude towards him as our creator and preserver, and a submission to his will as our supreme ruler and director, motives of all others the most powerfully conducive to a virtuous conduct.

X. It is this use which theology makes of philosophy, that has given occasion to divide the theses of the dogmatic into pure and mixed; that is, into theses that are founded entirely upon revelation, and, such as arise from an union of reason with revelation. Of the first sort are, 1. The article of the Holy Scripture itself; which treats of its divine origin, its authority, and its efficacy. 2. The dogma of the Trinity. 3. That of the origin of evil, or of original sin. 4. The whole article of Jesus Christ. 5. The dogma of the efficacy and operations of the Holy Ghost. 6. That of the sacraments. 7. That of repentance. 8. That of the belief in Jesus Christ. 9. That of good and bad angels. 10. That of the end of the world, and the last judgment. 11. That of the church, &c. The mixed dogmas or theses are, 1. The doctrine of a Supreme Being, in general; his being, his attributes, and his works. 2. That of the creation. 3. That of providence, or the conservation of the world. 4. Of sin, as a transgression of the laws of God. 5. Of rewards and punishments after death, &c. He that attentively studies, thoroughly comprehends, and well digests all these theses, will have reason to rest content with his knowledge of the dogmatic.

Of the Exegesis and the Hermeneutic.

I. The term Exegete is derived from the Greek verb ἔργονται, which signifies to relate or explain; and that of Hermeneutic from ἔργονευειν, which means to search into, and, in a figurative sense, thoroughly to examine, and interpret. The learned, but especially the theologians, make use of these words, sometimes as synonymous, to express the same thing, and sometimes (as there are scarce any terms that are perfectly synonymous) to denote a small difference between two parts of learning of the same nature. By the word Exegesis they mean, that science which teaches clearly to investigate the true sense of the original text of the holy scriptures; and by the Hermeneutic, the art of interpreting and explaining the holy scriptures or others. This distinction is so subtle, that it becomes almost frivolous. They are, in fact, the same science; the one is only an explanation of the other, and for that reason we think we are authorized to treat of them together in this place.

II. In order to the true understanding of the sacred text of all the books contained in the Holy Bible, whether of the Old or New Testament, it is absolutely necessary that the theologian be thoroughly acquainted, not only with the languages in which these books were originally wrote, but likewise with the history and antiquities of those remote times in which their authors lived. With regard to researches into the history of the Jewish nation, their antiquities, their morals, and their customs, it will be found advantageous to pursue it as far as the nature of the subject will admit, without, however, engaging in critical subtleties, that lead to a labyrinth to which there is no end, and have spread more clouds over theology than even the scholastic controversies have formerly done.

III. He who would successfully interpret any work whatever, should first consider the spirit in which it is written; he should attentively reflect on the general design of that work, and the particular motives that induced the author to undertake it; his genius, his passions, his taste; the time, the place, and the people for whom it was written. These considerations are, above all, necessary, when we would undertake the explication of the Holy Scriptures. Independent of those reflections which the theologian will of himself naturally make on the subject, the excellent commentaries which we have on the Bible, in which the greatest men of every age have exercised their genius, may serve him as a guide in this course. The critical histories will likewise afford great aid, and throw admirable lights on this matter. Clear ideas, an acute discernment, and a solid judgment, will complete the work.

IV. With regard to the languages necessary for understanding the sacred text, the Hebrew language hold the first place. The student should have early recourse to the manner of accenting, and the Massorets of the Jews: to these he may add, with advantage, the reading of the Jewish interpreters or Rabbins. There are the grammars and dictionaries, Rabbinic and Talmudic, of Buxtorff, Cellarius, and others, which greatly facilitate his study. The Talmud is true is stuffed with a thousand fables and ridiculous stories; it contains, notwithstanding, some things useful and curious, which the learned theologian should not entirely pass over. For the well understanding of the explications and applications of the best Rabbins, he should likewise have recourse to their Cabalas, which they divide into real and liberal.

V. The Massorets is a kind of critic on the Hebrew text, that the ancient Jewish doctors invented, in order to prevent any alteration. They there count the verses, the words, and the letters of the text, and have marked all their diversities. The text of the sacred books was formerly wrote in close continuation, without any division of chapters, verses, or even words, after the manner of the ancients, as we still see in many manuscripts. As the sacred books have undergone an infinity of changes, which form various readings; and the true original has been either lost or altered; the Jews have had recourse to this rule, which they have judged infallible, and which they call the Massora, to fix the reading of the Hebrew text.

VI. The ancient Rabbins, or Doctors of the Jewish law, have

* The Exegesis is a kind of rational grammar. The Hermeneutic is the art of interpreting entire passages.
have wrote many superflitious traditions, which they observe 
as copiously as the law of Moses; and have also made ma-
y commentaries on the sacred text, among which there 
are some that are good and useful. "The language they use 
here is different from the common Hebrew, as is also the Rab-
binic character.

VII. The Talmud is a book in which the Jews have 
comprised everything that concerns the explanation of 
their law, and the duties that are enjoined them by scripture, 
by tradition, or by authority of their doctors; by their par-
ticular customs, their civil government, their doctrine, their 
ceremonies, their moral theology, the decisions of cafes of con-
fidence, &c. The Talmud is composed, in general, of 
two parts; which are called, the Midrash, and the Gemara. 
The Jews would not at first commit these things to writing; 
but after the destruction of Jerusalem, finding themselves 
dispersed in the world, they became obliged to do it. 
They had two celebrated schools, one at Babylon, and the other 
at Jerusalem; at these schools were made two different col-
clections of traditions, each of which is called the Talmud. 
The commentary, called Gemara, contains the decisions of 
the Jewish doctors, and their explanations of the text; it 
is filled with absurdities, reveries, and ignorance, and written 
in a vulgar style. On the contrary, the text, that is called 
Midrash, consists of solid reasoning, written in a pure style. 
The Rabbin Moses, son of Maimon, has made an abridg-
ment of it, which is of more value than even the Talmud it-
self.

VIII. The Cabballa or Kabala (a Hebrew word, which 
properly signifies tradition) contains the different interpreta-
tions of the laws of God by different Rabbins; their deci-
sions on the obligations that they impose, and the manner of 
performing them. There are some of them that are occult 
and mysterious, and consist in singular and mystic signifi-
cations which are given to a word, or even to each of the 
letters that compose it; and from these various combinations, 
they draw explications of the scripture very different from 
that which it seems naturally to import. This Cabballa is 
divided into three kinds: the first they call Gematria, and 
consists in taking the letters for the numbers of arithmet-
icalk, and explaining each word by the arithmetical value of the 
numbers that compose it; the second is called Notarikon, 
and consists in taking each letter for a word, or in compo-
sing a word of the first letters of several words; the third is 
called Tiekuma, and consists in changing a word, and the 
letters of which it is composed.

IX. The Chaldees seems to be indispensible, after 
the study of the Hebrew and Rabbinic; this is proper-
ly no more than a particular dialect of the Hebrew lan-
guage. The Jews give to their commentators, and to the 
Chaldee paraphrase on the Scripture, the title of Targum. 
As, during their long captivity in Babylon, they had forgot 
the Hebrew, and only retained the Chaldee language; it 
became necessary to explain the prophets in that language; 
and to this necessity is owing the first commencement of the 
Chaldee paraphrase. The Rabbins have since collected to-
gether these divers interpretations of their doctors, which 
form the paraphrase that is called Targum.

X. The other oriental languages, as the Arabic, the Sy-
riac, the Samaritan, and the Coptic, are also of great use 
to the learned theologian.

XI. All the books of the New Testament being wrote in 
Greek, the study of that language becomes necessary to the 
thoels. But it must not be imagined, that this Greek 
is that of Athens or Lacedemon; and that they who under-
stand the New Testament, will fully comprehend Homer, 
Aesop, or Thucydydes. It is very necessary to observe, 
here, that during the Babylonish captivity, the Jews, as 
we have just said, having forgot the Hebrew, and having 
adopted, in process of time, several idioms, the Greek lan-
guage was at last successively diffused over almost all the east; 
and, at the time of the coming of Jesus Christ upon the 
earth, that language was in use in Palestine, not only among 
men of letters, but in the polite world: every thing was 
written, every thing was treated of, in Greek. The Jews no 
longer underlood the Holy Scriptures in the Hebrew lan-
guage, but made use of the version that the Septuagint had 
made of the Old Testament in the Greek language. The ev-
gelists and the apostles, therefore, wrote their historic 
relations, as well as their epistles or letters, in the same 
language: but their style is not pure, being filled with 
hebrisms and barbarisms, and with theological terms and 
phrases. The four evangelists differ, moreover, among them-
elves, with regard to their style; and so do the apostles: 
St Matthew is not so elegant as St John; nor St Jude so 
elegant as St Paul, who was a man of letters, and an able 
writer. The editions of St Luke is the most elegant, and 
most correct, especially in his book of the acts of the apostles.

XII. The translations that have been made of the sacred 
books in the west, will also very frequently affit in clearing 
up many passages.

XIII. The Jewish antiquities are naturally connected 
with the study of the sacred history of the Old Testament. 
Josephus is the best author who has wrote on this subject: 
John Michael, Vossius, L. iust, Gaisfeld, &c., are the 
moderns to whom we are indebted for learned researches in 
these matters. Hermannus Wulfius, in his treatise de E-
gyptiacis, has thrown admirable lights on the Egyptian an-
tiquities. The antiquities of the Chaldeans, Babylonians, 
Perfians and Medes, has been excellently well explained 
by Baronius Briffon, in his book de regno & rege Per-
farum; and by Thomas Hyde, in his treatise de religione et facri 
Perfarum. The writings of Meursius, and the Compendium 
Antiquitatum Grecorum of John Potter, are very useful 
to give theologians an idea of what they will find necessary 
to know of the Grecian antiquities; and lastly, the abridge-
ment of Cantet will make them sufficiently acquainted with 
the Latin antiquities.

XIV. Spencer has given an excellent work on the cer-
emonies of the Jewish religion, de Legibus Hebreworum ri-
tuallibus, &c. We have likewise works that fully treat of 
their temples, their sacrifices, their priests and Levites, their 
priestly and purific, of their tithes, their vestments and fa-
cred habits, and of their manners and customs; but it would 
be too prolix to mention all these in this place.

XV. The modern commentaries on the Holy Scriptures 
may also serve to instruct the young theologian; but he 
should use them with caution and moderation. All that 
shines is not gold, as well in this instance as in others; and 
a man of learning should not often make use of other peo-
ples eyes.

XVI. The Bibles called Polyglots are also of great af-
fistance in interpreting the sacred text. They are printed 
in several languages. The first is that of cardinal Ximenes, 
printed in the year 1515, and called the Bible of Com-
plete; it contains the Hebrew text, the Chaldean para-
phrases.
phrase, the Greek version of the Septuagint, and the ancient Latin edition. The second is that which is called the Royal Bible, printed at Antwerp in 1572. The third, that of le Fay, printed at Paris in 1645. The fourth is the English polyglot, printed at London in 1657, of which Walton is the editor. There are still fuller more that have been printed since, but they are neither so complete nor so celebrated as the former.

XVII. The Bibles that are called Biblia Graeca, are also here of very great use. The sacred text is there everywhere accompanied with explanations and observations. There are of these in each of the three principal communions of the Christian Religion, and in most of the modern languages of Europe. Lastly, as the interpretation of the sacred text depends in a great measure on the lights and the proofs drawn by comparing together different passages of scripture, there are several Bibles where the editors have placed, on the side of each verse of the text, what they call the Concordance; that is, a citation of other parallel passages, which are found dispersed in the Old and New Testament. These Concordances are of daily and indispensible use to the divine, in composing his sermons, and in many parts of his ministry. See Bible.

XVIII. These parallels in are yet different from that which theologians call the real parallelism; by which they mean, the relation that the typical or parabolic sense of a passage has with the expressions literally imply, or seem to imply; the mystic sense with the real sense; the figured and the images that the sacred authors have employed, with the things or the objects that they intended to describe. The greatest theologians have taken infinite pains in determining these points, explaining them, and producing their proofs: in many places they have succeeded; and we cannot but admire their sagacity, their zeal, and their success: but he will more wise, and less vain, than to attempt to impose his decisions on mankind, at all times, as authentic and infallible. The human discernment is ever confined and imperfect; and God has not granted to any man, to any theologian, or assembly of divines, an exclusive power of interpreting his divine word: he has moreover denounced his anathema against all those who shall add, or take away, a single word thereof. But to explore the true sense of any passage, and to explain it to others, cannot certainly be deemed either adding or retrenching.

Of Sacred Criticism.

I. As the authors and professors, who treat of the different parts of theology, make frequent mention of the sacred criticism, we must not omit to shew in what manner it is connected with the Exegesis and the Hermeneutic, and in what respect it forms a separate study or science. Criticism, in general, is in fact no more than a superior part of grammar; a kind of rational grammar founded on reflection, and the rules of language; but which employs the aid of divers other sciences, as history, chronology, antiquities, &c. in order to search out and determine the true sense of an obscure or ambiguous passage. The sacred criticism is only distinguished by its object; it adopts the same rules, but it adds others which take their rise and principles from the peculiar language of the New Testament; and has regard to the Bible in general, an account of the nature, essences, and qualities of its divine Author. So far it has an intimate connection with the Exegesis.

II. But, if we would consider it as a separate study, we may say, that it is a science which is employed in examining the exterior circumstances of the Holy Scripture. For example: in what time each book was wrote; who was its author; the precision and fidelity of the text; the difference between the canonical books and the apocryphal; and many other matters of like nature. In order still the better to shew in what manner, and with how much precaution, the sacred criticism proceeds in its operations, we shall here recite some of those subjects that belong to its province.

III. It is commonly received, that it was Elisha who, after the return from the captivity of Babylon, collected and fixed the canon of the sacred books of the Old Testament. Thereat least is the opinion of the Jews, who all attribute to him that glorious work; and the assertion appears so much the more probable, as it was the same Elisha who reestablished their state, who brought the whole Jewish people into one body as a nation, and formed the Judaic republic, which was so intimately connected with their religion. The collecting of the canon of the books of the New Testament is attributed, with great appearance of probability, to St John; although historic and formal testimonies of it cannot be produced, unless it be what Eusebius relates of the four Evangelists. In process of time, each council has decided what books should thereafter be held by the Christian church as canonical; and we commonly find, at the end of the decrees of each council, a repertory or list of those books.

IV. The Old Testament was wrote in Hebrew, except a small number of passages where the dialect is Chaldaic. The form of the letters or characters, as we now have them, are also properly Chaldaic; whereas, before the Babylonian captivity, the Samaritan character was probably used. Buxtorff and Capell have had warm disputes upon the subject of the vowel-points; the former would retain those points, and the latter rejects them; each of them has had his adherents. As it is impossible to decide in this dispute but by historic proofs,
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That of Symmachus, who applied himself to write the Greek with purity and elegance. 3. That of Theodotion, who has very closely followed the text, notwithstanding the fine language he employs. Origens published these versions in six languages in his edition of the Old Testament, which he calls Hexapla. To all these versions may be added, 4. Those of Jericho and Nicopolis, which are much celebrated. We have not now any one of these versions entire. The fragments that remain of them have been collected and published by Drujus and F. Montfaucon. Lastly, The Syriac versions, of which one was made on the Hebrew text, and the other on the Greek.

IX. The sacred criticism is likewise employed in acquiring a knowledge of the principal and most celebrated manuscripts, as well of the sacred text itself, as of the translations; in learning to discern the hand-writing, and the essential characteristics which distinguished the real original from the counterfeits: and lastly, it is employed in knowing the best modern editions of the Holy Bible; as for example, the Polyglots, among which those of London, of the years 1653 and 1655, are the best. The introduction by Walton, which is at the beginning of these editions, is a model and a masterpiece of sacred criticism.

Of Moral Theology.

I. If it were allowable to compare the Saviour of the world to a weak mortal, we would say, that the conduct of Jesus Christ resembled that of Socrates, who has left us no part of his doctrine in writing, but whole whole instructions (as well as the particulars of his life) have been collected, digested, and published, by his disciples. The Evangelists are the only historians of the Messiah: it is to their labours that we owe the knowledge of his actions upon earth, and his divine doctrine. The four Evangelists, and the Acts of the Apoftles, wrote by St. Luke, contain therefore alone the history of the life of Jesus Christ, and the doctrine that he taught. His apstles and disciples began by paraphrasing his doctrine, as well as their evangelic sermons, as in the epistles they addressed to the faithful of several Christian Churches: they have given explications, and have added pastoral instructions, which are in effect admirable; but which, nevertheless, form not the original text of the discourse of our Saviour. The bishops of the apostolic century, the fathers of the church in all succeeding centuries, the other bishops and ecclesiastics, the councils, the synods, the doctors of theology, the popes, the confiliators, the reformers likewise, and an infinity of theologians, have drawn from the Gospel, and sometimes also from the letters of the apostles, and from other commentaries on the Gospel, various tenets; which, united, form at this day the general system of the Christian Religion. The theologians who devote themselves to the service of the altar, study this system in the dogmatic: the laity learn it by means of catechisms; and after they have made confession of their faith, solemnly adopt it, when they are received into the bosom of the church.

II. It is not the same with regard to the morality of Jesus Christ, which every one may read in the Gospel; and to know which, it is not necessary to become learned, nor to study a complicated system. If the dogmatics were not armed with a thousand arguments to establish the Divinity of Jesus Christ, yet would the morality of his Gospel sufficiently prove it; seeing that it is perfectly holy, entirely simple.
simple, strictly just, and most-completely adapted to promote the felicity of the human race in this world, and in that which is to come. The Saviour of the world has not enjoined any part of mankind to engage in disputes, or abstract refinements: the sole command that he has given them is, to believe in his Gospel; and that is comprised in one word only. Love: the grand and only principle on which the whole of his sacred doctrine is founded.

III. To produce the greatest effects possible, by the least efforts, is the highest perfection in nature, and at the same time the true characteristic of Divinity. God has given to all the beings that compose the universe, one simple principle alone, by which the whole, and every part, is connected and perpetually supported; and that is Love. The attraction of the celestial bodies, as well as of those of which our globe is formed, is a species of love; a mutual tendency toward each other. The uniform generation, by which all beings are perpetuated, is founded in love. This is the true minimum; the true system of the least action, which includes something so divine. It appears to be the will of God to establish, by the mouth of the Messiah, the same simple principle in morality, that is, the rule of human actions, by saying, Love: in a word, it was his will, that in the conduct of mankind, as in every other part of nature, there should be no other principle than that of Love.

IV. That in the different systems of ethics of the ancient Heathen Philosophers many maxims and precepts of admirable morality are to be found, cannot be denied; but, beside that these philosophers are almost continually contradicting each other in their maxims, no one of their systems is founded on the true principle. In searching after it, they have discovered some excellent truths; but it has been by chance, and they are at best imperfect. Jesus Christ has alone taught mankind perfect morals, by deducing them from this true principle. Every principle should be simple; the idea of a compound principle implies at once an imperfection. Every principle should be comprehensive, even universal in its effects. Every principle, whose effects are limited, is imperfect. God himself is uniform in his principle, and infinite in his effects. His doctrine, or his law, should be the same. Jesus Christ has made known to mankind this principle, simple and universal. He has therefore been, in this sense also, the true Saviour of the world. He has preached to mankind; and his only doctrine has been that of Love.

V. By the word Love, with regard to Bodies in general, in mean a tendency, a mutual inclination that urges them to join and to coalesce; and with regard to men in particular, a lively, affecting pleasure, that possesses the mind on contemplating the perfections of any object. This pleasure is always accompanied with a desire, either to posses that object, or to render it propitious. By adopting therefore this principle, and this last definition of Love, it follows, that all the duties of man consist,

1. In the love of God in preference to all other objects.
2. In the love of himself.
3. In the love of his own species.
4. In the love of every other creature to a certain degree.

The doctrines of Jesus Christ are, in these respects, the most explicit.

VI. From this principle flows our duty towards God, towards ourselves, our neighbour, and to those beings that are subject to our power. The first rule is, to communicate to all those, whom it is our duty to love, all the good, and to preserve them from all the evil in our power. The second, to do to no one what we would not have done to ourselves in similar circumstances. The third, which is the simple effect of love, is to endeavour to please the object that we ought to love. The fourth, to endeavour to render the pleasures that we communicate to others, as lively as possible, and those inevitable evils, which we are sometimes constrained to do to them, as supportable as we can; and of the reft. The whole evangelical doctrine of our Saviour is replete, from beginning to end, with admirable precepts for these purposes; and these precepts, with their applications, general and particular, we learn from that science which we call Moral Theology.

VII. This doctrine we distinguish from moral philosophy, or the simple doctrine of Ethics; because Jesus Christ has made known, in his divine morality, a far greater degree of perfection than is discoverable by the mere light of human reason. For the renouncing of self-interest, and private pleasures; the forgiveness of offences; the love of his enemies; the triumph over destructive passions; and many other like virtues, the Christian is alone indebted to the doctrine of Jesus Christ.

VIII. In order to shew, moreover, in a few words, of how easy, just, and natural an application all these precepts are susceptible, we shall here give a few instances. "It is our duty to love God." Now nothing is more natural than to feel a lively and penetrating pleasure in the contemplation of the united perfections of the Supreme Being; nothing more natural than a desire to please him, and to render him propitious to us: and as it is not possible for us, weak creatures, to do him either good or evil, all our power to please him consists in offering him an upright heart; a rational devotion; to be possessed with gratitude toward him, and to exert all possible efforts to accomplish the end of our creation. "It is our duty to love all mankind:" and yet we inflict pains and chastisements on some of them; we even put them to death; but we chastise them only to render them better, to prevent them from becoming pernicious to society in general: we retrench the number of the living, as we cut off a corrupted branch of a tree, in whose preservation we are interested: it is because we love mankind, that we endeavour to prevent the destruction of the good by the malignity of the wicked: but it must ever be an indissoluble necessity alone that can compel us to chastisement. "It is our duty, likewise, to feel a kind of love for other creatures, even for mere animals." Nevertheless we harass, we oppose, we destroy them. "If we harass them wantonly, to support a criminal luxury, or to satisfy a brutal pleasure; if we pursue a savage chase, or encourage combats between animals themselves, or other like horrible diversions, we act contrary both to the spirit and the letter of the Gospel. But if we destroy a part of these animals, to serve as an indissoluble nourishment to man, observing at the same time to put them to the least misery possible, and taking all necessary care for the preservation of the species, we act in conformity to the laws of nature and of morality; we employ to our own preservation, and to that of the rest of mankind, what appears destined to that purpose by the Creator.

IX. Moral theology likewise differs from philosophy, inasmuch as it requires that our virtues be absolutely disinterested: it enjoins us to fly the evil, and to pursue the good, merely as our duty towards God: it admits indeed the precept of the love of ourselves, and the love of our neighbour; but
RELIGION, or THEOLOGY.

but it regards this love only as a duty that results from our love towards God; and that from the principle, That God must love all his creatures as the work of his hands; and that we cannot therefore, from the very nature of love, please him, without entertaining sentiments of affection towards those to whom the Sovereign Lord of the Universe vouchsafes his benign regard. Now, as the Christian morality does not regard virtue, but as it is a duty towards God; and as it considers all our actions, that have any other motive, either as blameable, or at least imperfect, and as but little acceptable to the Supreme Being; it does not regard the advantages that result from them to society, but as useful consequences of the true Christian virtue; and from this principle it draws new arguments for the encouraging of mankind to the practice of it.

X. From what has been said, a second difference arises between Christianity and philosophy. The first adds to the second still new motives to the practice of virtue. That of redemption, and pardon, obtained by Jesus Christ, is not one of the least. Its argument is this: If God has so loved mankind, as to afford them the means by which the evil, caused by their own fault, may be abolished, it would be the greatest of all ingratitude and malice towards himself, if man should not endeavour to acknowledge this love, to merit it, and to embrace the means of pleasing God. A third motive, taken also from the merit of Jesus Christ, here offers itself as an auxiliary to the two former: According to the Christian doctrine, man has not by nature the power to practise all those virtues which are agreeable to God: but the same doctrine teaches, on the other hand, the conditions by which it is possible to please that most holy and perfect Being; and gives the Christian hope also, that he shall never labour in vain.

XI. Lastly, the Christian morality is of far greater efficacy in adversity, than philosophy: it carries with it a wonderful consolation in misfortune, and even in the hour of death; for the Christian may say, with the Apostle, that godliness (or the practice of evangelical morals) is in all things profitable, having the promise of the present life, and that which is to come.

Of Polemic THEOLOGY, or Controversy.

I. We cannot sufficiently lament, that the church of the God of peace should be a church militant; and that a doctrine so simple and clear as that of the Gospel should be the cause of discord, even among Christians themselves. Nevertheless, as the truth is so difficult to discover in all things, and especially in matters of religion; as it is so frequently covered with the clouds of interest and ambition; as the same object appears so different to different men; and as error, in the face of the world, constantly assumes the mask of truth; it is but just that the true religion be furnished with arms to combat error, and to pluck off that deceitful mask by which so many poor mortals are seduced.

II. The theologian, who has made the proper preparatory studies, who is thoroughly instructed in natural religion, in the dogmatic and the hermeneutic, and who joins to these found logic, is already well prepared for this spiritual combat: he is armed, but he is still to learn how to use these arms: he must also be made acquainted with the enemies he has to encounter, to know their force, and the arts they will use against him. It is plain enough, we suppose, that we here speak of spiritual arms; of those with which we are furnished by reason and the Holy Scripture: evil be to him that employs any other: force is an infallible proof of the want of argument. The propagation of a religion by the sword, after the manner of Mahomet; perfections, either secret or open; constraint, violence, every sort of religious war, is so atrocious, so contrary to the spirit of the Gospel, in a word, so detestable, that every true Christian must avert his sight from such infamous horrors.

III. Controversy is conducted, either from the pulpit or chair, by way of harangue, by conversation, or by writing. The first quality that is necessary to a disputant is reason, and the next moderation; in what manner the contest is conducted, these two qualities should constantly be manifest, during the whole course of altercation.

IV. There are some errors that attack the system of religion, and there are others that attack even its morality. In order properly to oppose an error, we must begin by finding out its real meaning; we must therefore study the different systems of other religions, and the principal heresies, if we would successfully refute them. We don't mean by this, that the theologian should know all the errors that spring up in the brain of each individual; we speak only of those that are preferred by whole sects.

V. They who attack our religion, found their opinions, either on the interpretation of the sacred text, or on philosophy, or history; and we should always oppose them with the same arms with which they pretend to defeat us. It is necessary to begin by dethroning ourselves of all prejudices, in order the better to shew others these prejudices by which they are deluded. We should not make use, but especially when we oppose weak minds, of opprobrious terms in the course of the debate, nor contend about words or expressions, nor attack incidental circumstances that may attend erroneous principles; but bend our whole force against the root of the tree, the principal error, to uncover it, to dig it up, to destroy it.

VI. Polemic theology is taught in universities by two methods, according to the views of the student. If he learn it merely in order hereafter to defend his pantheism against the most prevalent errors, he is only to examine the principal controversies according to the systematic order of theology; and may content himself with knowing their true meaning, together with the arguments of those that oppose them. But if it be his intention to teach this science to others, or to engage in controversy, either by conversation or writing; in short, if he aspire to renown in it, he should study the origin and history of each controversy, he should make himself a complete master of the arguments for and against it, the exceptions that it makes, its interests, its different revolutions and actual state, &c. These follow, in this study, either the order established in the dogmatic, or that which is used in symbolic books, that is, such as treat on articles of faith.

VII. In order the better to elucidate the method to be observed in this sort of study, we shall say, that to acquire a complete knowledge of theological disputes, the student should, 1. Make the examen of each religion, and even of each controversy. 2. He should thoroughly examine his system in the symbolic books, and likewise the sources of his religion. 3. He should precisely determine the principal and capital error of each religion, sect, or individual; that which is the source from whence all the other errors flow. 4. Search into the political causes of each error, and each.
each controversy, from history. 5. Examine the natural order according to which all the errors have taken their rise, the one from the other: and lastly, 6. Confront the respective arguments, the answers, and exceptions, that each party has made to defend its cause. To all this is to be added, 7. What they call Collegium disputatorium; an exercise, by which all that is learned in the closet and in the schools is called forth and animated, under the inspection of a professor; and the mind is accustomed to think, and the tongue to speak, with facility and efficacy.

VIII. The principal contests in which the theologian may be engaged, are, 1. Against those who admit of no revealed religion; as the atheists and deists. 2. Against those who admit of a revealed religion, but adopt not the true Revelation; as the Heathens, the Mahometans, &c. 3. Against those who believe only a part of the true Revelation; as the Jews. 4. Against those who add to the true Revelation matter foreign to it; as traditions, &c. 5. Against those who make a false interpretation of the sacred text, and draw from it erroneous systems; as the heretics and the schismatics, &c. And lastly, 6. Against those who make a wrong use of certain expressions of Revelation, and build, on whimsical notions, ridiculous systems; as the Fanatics, Quakers, &c.

IX. According to this division, the theologian will have to combat principally with,
1. The Atheists, with Spinoza at their head.
2. The Deists.
3. The Heathens and Idolaters.
4. The Mahometans.
5. The modern Jews.
6. The Arians and Manicheans, or rather those who in these days follow their ancient errors.
7. The Socinians.
8. The Catholics, opposed to the Protestants.
9. The Protestants, opposed to the Catholics.
10. The Molinists, opposed to the Jansenists.
11. The Jansenists, opposed to the Molinists.
12. The Reformed, opposed to the Lutherans.
13. The Lutherans, opposed to the Reformed.
14. The Arminians.
15. The Anabaptists.
17. The Quakers or Tremblers.
18. The Fanatics, at the head of whom is Jacob Bohm.
19. The pretended new Prophets.
20. The Indifferentists.
21. The Pietists.
22. The Moravian Brethren, or the Herenhuters, &c.

X. Now, as each of the religions, communions, or sects above mentioned, have not scrupled to publish to the world their dogmas and creeds, the theologian ought carefully to instruct himself in those symbolic books, in which each of them have comprised its system; to study and to make a good analysis of them; and to prepare such arguments as are the most just, the most weighty, and proper to confute them.

XI. Before we quit this subject, there is one remark to be made, or rather one caution that is very essential, which we would offer to the young theologian; which is, that the polemic is useful, and even necessary in the study of theology in general; but that it is a discipline which ought to be treated with great prudence and moderation. Disputation in general is a dangerous art; and religious disputation is a deceitful art, and of infinite peril. The student will do right well to remember, that there is no sect, no communion on earth, that is perfectly true in all its dogmas without exception; that there are some small errors in all religions; that infallibility never was, nor ever will be, the portion of humanity. He should likewise remember, that the masters who teach him, or the books that he reads, are constantly partial to the religion they profess; and that when he has supported a thesis, and confuted his adversaries in a collegial dispute (where his adversaries, as well as his preceptors, are of the same side of the question, and will not fail to adjudge him the victory,) he should be persuaded, that the victory would not have been so easily obtained had he contended with able adversaries of the opposite religion; he should remember, that we triumph without glory when we combat without danger; and let him not be vain of his laurels, nor imagine himself some wonderful scholar; seeing that it is very possible, that he may go off victorious from such a dispute, that he may receive vast applause from his professors and his colleagues, and at the same time have reason to doubt.

XII. On the other hand, the most able theologians, and the most consummate professors in this science, ought to be constantly on their guard against the abuse of polemic theology; which frequently serves to clear and confirm the truth of the dogmas of a communion, than to establish perpetual discord and hatred among Christians. Every theologian should also remember, that by the nature of the subject, it is not possible to produce demonstration in support of his theses and opinions; but that his arguments will be only valid, and preponderate in proportion to their degree of evidence; and lastly, that it is a ridiculous and insufferable vanity to imagine, that every man, who does not think precisely as we do, is guilty of palpable error.

Pastoral Theology.

I. Having described the theoretic sciences of theology, we now come to those which regard the practice. It would be to bury the talents that God has given him, and the studies that he has made, if the theologian did not employ them to the edification of his neighbour, and the prosperity of the Church. His office in society is attended with constant and anxious labours. He is charged with the cure of souls, with the instruction of youth, with preaching of the Gospel, the conduct of his flock, and the administration of the Sacraments, with visitations to the sick and the dying, with calming the terrors of weak minds, with administering comforts to afflicted souls, and many other functions equally difficult and important. The practical sciences that we shall here describe, will serve him as guides in this unbounded field.

II. Pastoral theology is usually divided into three parts; which are,
1. Homilitic Theology.
2. Catechetical Theology.
3. Casuistic Theology.
To which are added;
4. The Consistorial Prudence.
5. The premeditated Exercise of the different functions of the minisiry.
As the homily makes a part of eloquence, it is unnecessary to say any thing of it in this place, but treat the others in their order.

III. It is in vain that a son of the church possesses all the sciences that belong to his profession, that he is an agreeable and even a renowned preacher, if he do not give a life, an efficacious spirit, to his ministry, by a good example; for that is the first precept in pastoral theology. He is at the head of a flock, and ought to be their guide: but how absurd, if his words and his actions be at continual variance with each other! How scandalous, if he be not the first to practice these lessons of wisdom that he preaches! How indecent, if, while he edites by his discourses, he dilutes by his morals! What baseless, if it should even glory in his irregularities? It is left shameful for a father to relate that he has tamely suffered an affront, than for an ecclesiastic to praise these lessons of wisdom that he preaches! How incredible, if he should vainly hope to mend his morals, and a dogmatic and clerical manner of deciding the common affairs of life; a ridiculous inclination to discover inquiry in innocent actions; to confound pleasure with vice, and to be an enemy to joy, the greatest boon that God has bestowed on man; and a hundred other like foopies there are, with which the religious make a parade, that is shocking both to good sense and the evangelical morality, and which render their ministry, in the eyes of sensible people, more contemptible than respectable. These are rocks on which the young theologian is much too liable to run, and of which he cannot be sufficiently cautioned.

IV. But this exemplary conduct should be free from all affectation in the external behaviour. A singularity of dress, and an air of asperity; the head declined, the eyes turned up to heaven, the hands constantly clasped, a plaintive tone of voice, and a solemn gait; a scrupulosity in things indifferent, and a dogmatic and clerical manner of deciding in the common affairs of life; a ridiculous inclination to discover inquiry in innocent actions; to confound pleasure with vice, and to be an enemy to joy, the greatest boon that God has bestowed on man; and a hundred other like foopies there are, with which the religious make a parade, that is shocking both to good sense and the evangelical morality, and which render their ministry, in the eyes of sensible people, more contemptible than respectable. These are rocks on which the young theologian is much too liable to run, and of which he cannot be sufficiently cautioned.

V. After this candid caution, and brief introduction, we pass to the examen of the different parts, the union of which composes the system of the pastoral, the most important article perhaps, in all theology. The design of Revelation was, without doubt, to conduct man by faith to a virtual life. It is not the opinions or the learning of weak minds the Aril principles of religion, such as are contained in good catechisms, and that they be explained to them in particular lessons; which is the most usual and most natural method of enabling youth to give an account of their faith. The sermons that are given in the catholic churches on controversy, and in protestant churches on the catechism, serve to instruct those who are of riper years and have their judgment more formed. These sermons compose, at the same time, a sort of course of the dogmatic and the polemic theology.

III. Both in private catechising, and in sermons that are purposely intended to explain the catechism, the theologian should avoid, as much as possible, the use of technical terms; or (which is still better) he ought to begin by explaining those terms, of which he should give such clear and determinate definitions, that no person of a moderate capacity can possibly mistake them. In a word, he should endeavour more to prove than to persuade; and as eloquence sometimes persuades at the expense of truth, he should cautiously avoid that sort of delusive persuasion, and in its room substitute clear and solid argument.

Of Casuistic Theology.

I. Happily for man, and for society, all are not so obstinate, or so inoffensive, as to ask, what sort of animal conscience is, or never to know what is remote. Happily, the greatest part of mankind are sensible, that all their actions are not conformable to the laws of divine wisdom, nor to the rules of natural equity; are afflicted at their past conduct, and find a generous and earnest desire arise in their souls to avoid for the future those dangerous rocks. To calm the troubled mind; to appease the timorous conscience; to communicate the confolations of grace to the afflicted soul; to explain and decide in doubtful cases; to direct those that err, and to support their weakness; to convince such as persist in their errors; to pierce the hardened heart; to intimidate the wicked, and to rouze the indolent; to conduct the Christians, committed to the care of their pastor, in the way that leads to true felicity; are the important objects of casuistic theology, and for which it affords the proper instructions.

II. In a more confined sense, by casuistic theology is meant, the science that decides in doubtful cases of moral theology,
The need of their counsel and consolation: for where there is no sign of service to those of their fellow citizens who have afforded them the means and the opportunities of rendering theologian is supposed to have made, and the confidence abused that is made, in some Christian countries, of the dual and important, that he who devotes himself to the service of the altar, should early study all those sciences which will enable him worthy to perform this important part of his ministry.

IV. God forbid, however, that we should countenance the abuse that is made, in some Christian countries, of the duties that we have here explained. To reduce these matters into a political system; to make the direction of consciences a profession, a regular trade; to provide each house with a spiritual director, as with a butcher or baker, a steward or porter, who by that mean may infinuate himself into the confidence of families, and become the depository of all their secrets; may sometimes sow discord between husband and wife, or the nearest relations; who may avail himself of the confidence of his devotees, to direct them confultantly in matters of a worldly, and sometimes even of a criminal nature; to efface the legitimate and sacred authority of the father of a family, and, in its place, to substitute a foreign power; to undermine the confidence, the union and concord of families, in order to confirm and render necessary this secondary authority; to captivate the spirit, and oft-times the heart of a wife or daughter, and in general of weak minds; to enjoin them ridiculous mummeries that lead to fanaticism, and a thousand dangerous superstitions, or to religious exercises that divert them from their domestic duties; in a word, to assume an absolute authority over the consciences of mankind, is a pernicious invention, contrary to the evangelical moral, to the welfare of society, to the interest of the state, and to the sovereign authority; and well deserves an exemplary punishment.

V. But the care of souls, faithfully intended, and properly limited, differs totally from this despotic power. He, who is charged with it by a lawful vocation, should remember that there are four classes of men with whom he will be engaged: 1. With those of weak minds; of little knowledge, and little ability. 2. With those whose spirits are afflicted by some great reverses of fortune. 3. With those of nice and timorous consciences, who suffer by their scruples, whether they be vain or rational. 4. And lastly, the wicked, the hardened and incorrigible sinner. The grand art here consists in representing to each of these classes of men, the truth, in a manner so clear, so strong and full, that they can no longer retain any doubts, that conviction must take place, and conformation or conversion be the consequence.

VI. Truth is in its nature highly problematic: each one, however, is persuaded that he knows it, that he possesses it, and is guided by it; every man thinks himself in the right. We should therefore begin by discovering the truth in the subject before us, and in placing it upon a solid foundation. This business of demonstrating the truth to others, is attended in the mean time with infinite difficulty. Every mind is not capable of discovering it at the first glance; nor can all discern it from the same point of view. Sometimes men require conviction by abstract philosophical arguments, and sometimes by the express decisions of the Holy Scripture. Sometimes by authority, sometimes by gentle remonstrance, and sometimes by dreadful menaces. Sometimes they are to be reclaimed by properly exposing the necessary and fatal consequences that result from their conduct; and at others, by the alluring promises of the Gospel. Now vice is to be boldly confronted; and now the transgressor is to be conducted into the right path by artful turnings; now the sinner's crimes are to be painted in the strongest colours; and now a veil is to be lightly cast over them; and sometimes we should even indulge a favourite inclination, in order to induce them to abandon a more pernicious passion: and so of the rest.

VII. As it is impossible that the books which have been wrote on this subject, though of an immense quantity, can contain every case that daily occurs in the ministry of the Gospel; and as these cases are not always justly decided by these authors; and, if they were, the consulting of such enormous works would take up too much of a theologian's time, and divert him from his other studies; and as the cauflitic writers contain, moreover, a number of puerile subtleties and wretched chimera; it is highly proper that the minister of the altar, whom we suppose to have a masterly knowledge of the principles, the dogmas, and moral of the Christian religion, should endeavour to draw from the true source the means that he is to employ on each occurrence, and not have recourse to books for their decisions. For which purpose it is necessary, 1. That he accomplish himself to reason according to the rules of sound logic. 2. That he learn to know the human heart, under its different disguises; the characters of men, their arts, and ruling passions. 3. That he do not attempt to gain or convince by little pious frauds, or by lucky sophisms artfully represented. 4. That he do not inflict what are called penances, which are the height of absurdity. 5. That he do not enjoin mummeries, pilgrimages, austerities, and a thousand like matters, which can never carry with them a real conviction, and only serve to divert men from their labours and the duties of society. But, 6. That he constantly present, as we have before said, and cannot too often repeat, the truth, in all its native force and purity.

VIII. This truth, however, is no enemy to sacred eloquence; on the contrary, the latter serves to introduce the former into the mind of the auditor, and there to give it such strong impressions, as neither time, the dissipations of the world, nor the distractions of fortune, are able easily to efface. The whole ministerial function consists in teaching, preaching, administering the sacraments of the church, visiting the sick and the dying, comforting the afflicted, and affording the spiritual aids to all those who have need of them. Eloquence is of the greatest efficacy in all these functions; and, without affecting it, the minister of the gospel should never neglect it. There are some professors in universities who give their auditors a complete fylematic course on pastoral theology, which may be attended with many advantages.

Consistorial Prudence, or General Economy of the Church.

I. Among the practical sciences of theology, we must...
not pass over in silence that which is called the Consistorial or Ecclesiastic Prudence, whose object is the exterior order or arrangement of the Christian church, on principles founded on the Holy Scriptures; and which are proper, not only to maintain religion in its purity and splendor, but to defend it against all schisms, divisions and separations whatever. This economy is necessary in the councils, the synods, the consistories, and in the faculties of theology. We must not, however, confound this with the ecclesiastic jurisprudence, which is the science of interpreting and applying the laws, instituted by the sovereign, relative to the persons, goods, and affairs of the church; whereas the object of consistorial prudence is the arrangement of the church itself, and the ecclesiastic state, on Christian and rational maxims. The one is a sort of legislation in itself; and the other, on the contrary, an application of the civil laws.

II. The theological prudence includes therefore, first, the whole plan of church-government, and the arrangement of the ecclesiastic state; secondly, the ordinances relative to exterior ceremonies, and divine worship; and lastly, the discipline of the church, the errors, the schisms, the heresies, and divisions that arise among Christians. The source of this prudence is a thorough knowledge of the essence of the Christian religion, and the method of drawing from it just consequences.

III. This discipline is likewise employed in deciding, wherein consists the difference between the clergy and the laity; or if there be, in fact, any real difference between them: if the church form a distinct state in the general system of government; and to whom belongs the right of deciding circa facra; and what are the limits of the spiritual and temporal powers in this respect: wherein consists the hierarchy of the church, and what are its rights and privileges: to whom appertains the nomination of a prelate, or other ecclesiastic, according to the divine ordinance: to whom is committed the right of preaching in public, of administering the sacraments, and of exercising the communicative power of expelling, or again admitting, any particular Christian, or even a whole country, into the pale of the church: the bans and interdicts; the exercise of sacred or theological studies; the schools, the seminaries, the universities and academies, the clergies, the convents; and so of the rest: all subjects vigorously attacked and obstinately defended.

IV. The consistorial prudence examines likewise the liturgies, the ceremonies and religious customs, the brevies, the rituals, the canons, and other books of devotion adopted by the church; the formularies, the rite of discipline, &c. the credos, the confessions of faith, the catechisms, and many other like matters; and lastly, the doubts and objects of controversy, that occasion the holding of synods and councils; the question, if the Pope be above the councils, or the councils above the Pope; the practice of elenchastic theology, or the public elenchy; the separation and reunion of the church, which the Syncretists and Hellenists dispute; the divorces more or less allowable; matrimonial, and consistorial matters, &c. &c.

V. All these subjects, and an infinity of others, which arise from, or have an immediate connection with these, require to be thoroughly considered, reduced into a regular system, explained and fixed on solid principles, and confirmed by just and pertinent examples. From all this results what is called Ecclesiastic Prudence. This science has not yet been reduced into a system or formal discipline, and that principally because it has been constantly confounded with the ecclesiastic law: but that in reality differs as much from this, as political prudence differs from the common law.

Of Theologic Prudence in the Different Functions of the Ministry.

I. Independent of casuistical theology, and of the economy of the church in general, the theologian has, moreover, need of great sagacity in the particular exercise of his ministry; and many able divines have reduced this science into a system, and have given general precepts, and particular rules, for the conduct of the minister of the altar, in the different circumstances that may arise in this part of his duty. We shall decline the particular explanation of these different systems, as it would lead us into numberless minutiae. Conrad Porta has wrote a work on the subject, intitled Paffiole Lutheiri; Stoltzhus, Korthout, Philip Hahn, Hartman, and many other theologians, have wrote large volumes concerning it: but, above all, the treatise of Dr. John Mayer, which is called Museum Minifteri Eccle- siæ, is to be consulted on this matter. We more readily omit the names and titles of other works of this kind, as we have prescribed it to ourselves as a law, to avoid, as much as possible, these sorts of citations, seeing that the number of new books that are continually appearing frequently supercede their predecessors; and moreover, in this part of theology, each Christian communion has its particular authors, who treat it in conformity to the dogmas and principles which that communion adopts.

II. The humour of reducing every thing into system, has also taken place in this matter, which in fact appears to have no occasion for any peculiar discipline that could not be included under some other part of theology. But as this distinction is already made, it is our business to explain it, for the use of such as devote themselves to the altar. The prudential theology is, for them and their ministry, what political prudence is for a man of the world in the commerce of life. It is the art of attaining the end proposed: and as each condition in life has its particular pursuits, the divines have also naturally theirs, and the precepts of theological prudence serve to conduct them to it.

III. But as the dogmas, the ceremonies, the rites and objects that the ministers of the different Christian communions propose to themselves, are by no means the same, each communion, each sect, does not follow, in this respect, the same rules and precepts, nor even part of the same principles. All that we can therefore do amidst this diversity of opinions, and contrariety of maxims, is to point out, in a few words, the principal objects that one or other of them comprehend in this part of their pastoral theology.

IV. The Afcetic Theology, for instance, treats of the various particular exercises of piety; and the principles, that it propounds with this regard, serve as guides to the minister of the altar, in his recommendation of the practice of it, as well as in many parts of his ecclesiastical duty. Falls, pilgrimages, and many other matters of the same kind, belong to the province of ascetic theology, and which we will not absolutely reject, because we write for readers of all sorts of comunions. Truth, however, obliges us to remark, that the ascetic theology of every communion is the offspring of principles falsely attributed to the Gospel, and belongs
REMEMBRANCE, or THEOLOGY.

REM. REMEMBERANCE. See MEMORY.

REM. REMEMBRANCERS, antiently called clerks of the remembrance, certain officers in the exchequer, whereof three are distinguished by the names of the king's remembrancer, the lord treasurer's remembrancer, and the remembrancer of the first fruits. The king's remembrancer enters in his office all recognizances taken before the barons for any of the king's debts, for appearances or observery of orders; he also takes all bonds for the king's debts, &c. and makes out processes thereon. He likewise issues processes against the collectors of the customs, excise, and others, for their accounts; and informations upon penal statutes are entered and filed in his office, where all proceedings in matters upon English bills in the exchequer-chamber remain. His duty further is to make out the bills of composition upon penal laws, to take the statement of debts; and into his office are delivered all kinds of indentures and other evidences which concern the asiling any lands to the crown. He, every year in craltino animarum, reads in open court the statute for election of sheriffs; and likewise openly reads in court the oaths of all the officers, when they are admitted.

The lord treasurer's remembrancer is charged to make out processes against all sheriffs, escheaters, receivers, and bailiffs, for their accounts. He also makes out writs of fieri facias, and extent for debts due to the king, either in the pipe or with the auditors; and processes for all such revenue as is due to the king on account of his tenures. He takes the account of sheriffs; and also keeps a record, by which it appears whether the sheriffs or other accountants pay their proffers due at Easter and Michaelmas: and at the same time he makes a record, whereby the sheriffs or other accountants keep their prefixed days: there are likewise brought into his office all the accounts of customers, comptrollers, and accountants, in order to make entry thereof on record: also all cistrei and amercements are certified here, &c.

The remembrancer of the first-fruits takes all compositions and bonds for the payment of first-fruits and tithes; and makes out processes against such as do not pay the same.

REMINISCENCE, that power of the human mind, whereby it recolles its self, or calls again into its remembrance such ideas or notions as it had really forgot; in which it differs from memory, which is a treasuring up of things in the mind, and keeping them there, without forgetting them.

REMISSION, in physics, the abatement of the power or efficacy of any quality.

REM. in law, &c. denotes the pardon of a crime, or the giving up the punishment due thereto.
RENUCATION, Te adt of renouncing, abdicating, or
REVERSE', inverted, in heraldry, is when any
RENT, in law, a fum of money, or other consideration,
REPARTEE a ready smart reply, especially in matters of wit, humour, or raillery.
REPEALING, in law, the revoking or annulling of a statute, or the like.
REPEAT, in music, a character showing that what was last played or sung must be repeated or gone over again.
REPELLENTS, in medicine, remedies which drive back a morbid humour into the mass of blood from which it was unduly secreted.

RENUNCIATION is in Scots law. See ADJUDICATION.
REPRESENTATIVE, one who personates or supplies the place of another, and is invested with his right and authority. Thus the house of commons are the representatives of the people in parliament.

RENOWN, something resembling the figure or shape of kidneys.

REPLENISHMENT, the restituting of an act.

REPTILES, 

The most remarkable in the class of repellents are the white of an egg, the laps calaminaris, litharge of gum, red-lead, turvy, pampholix, house-leek, putty, and cow-web. REPELLENT, the restituting of an act.

REPELLENT, in rhetoric, a figure which gracefully and emphatically repeats either the same word, or the same fentences in different words.

REPLETION, in medicine, a plenitude or plethora. See PLETHORA.

REPRESENTATION, in the drama, the exhibition of a theatrical piece, together with the scenes, machines, &c. See COMPOSITION.

REPUTATION, the reiterating of an act.
REQUEST, in law, a supplication or petition preferred to a prince, or to a court of justice, begging relief in some controversial cases where the common law grants no immediate redress.

REPULSION, in physics, that property in bodies, whereby, if they are placed just beyond the sphere of each other's attraction, they mutually fly from each other. See Electricity, and Mechanics.

REQUEST, in law, a supplication or petition preferred to a prince, or to a court of justice, begging relief in some controversial cases where the common law grants no immediate redress.

Court of Requests, an ancient court of equity, instituted about the nineteenth year of Henry VII. See Court.

In the fortieth and forty-first years of queen Elizabeth, it was adjudged upon solemn argument, in the court of common pleas, that the court of requit was then no court of equity.

REQUIEM, in the Roman church, a mass sung for the rest of a person deceased. See Mass.

REQUISITION, in Scots law. See Law, Tit. xiv. 7.

Res Judicata, in Scots law. See Law, Tit. xxxii. 4.

RES Publica, in Scots law. See Law, Tit. viii. 2.

RESOLUTION, in chemistry, be. the reduction of a mixed body into its component parts, or bit principles, by a proper analysis. See Chemistry, p. 100.

RESONANCE, Resounding, in music, be. a sound propagated through a body of solid substance, and returned by the air, inclosed in the bodies of stringed musical instruments, as lutes, &c. or even in the bodies of wind instruments, as flutes, &c. See Music, and Pneumatics.

RESPiration, the act of respiring or breathing the air. See Anatomy, p. 281.

RESPITE, in law, &c. signifies a delay, forbearance, or prolongation of time, granted any one, for the payment of a debt or the like.

RESPONDENT, in the schools, one who maintains a thesis, in any art or science; who is thus called, from his being to answer all the objections proposed by the opponent.

RESPONSE, an answer or reply. A word chiefly used in speaking of the answers made by the people to the priets, in the litany, the psalms, &c.

RESSAULT, in architecture, is the effect of a body which either projects or sinks back; that is, stands more out or in than another, so as to be out of the line or level with it.

RESSERT, a French word, sometimes used by English authors, to signify the jurisdiction of a court, and particularly one from which there is no appeal.

RESIDENT, a public minister, who manages the affairs of a kingdom or state, at a foreign court.

They are a class of public ministers inferior to ambassadors or envoys; but, like them, are under the protection of the law of nations.

RESIDUE, the remainder or balance of an account, debt, or any thing else.

RESIN. See Chemistry, p. 94.

RESIGNATION, in Scots law. See Law, Tit. xiv. 7.

RESISTANCE, or Resisting force, in philosphy, denotes, in general, any power which acts in an opposite direction to another, so as to destroy or diminish its effect. See Mechanics, Hydrostatics, and Pneumatics.

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RESIDUE, the remainder or balance of an account, debt, or any thing else.
RESUSCITATION, the fame with resurrection and revival.

RESTITUTION, in a moral and legal sense, is restoring and retrieving the strength and vigour both of the body and animal spirits. All under this class, says Quincy, are rather nutrimental than medicinal and are more administred to recover the waffles of the constitution, than to alter and rectify its disorders.

RESTORATIVE, in medicine, a remedy proper for restoring and retrieving the strength and vigour both of the body and animal spirits.

RESTORATION, the fame with restitution. See Restoration.

RESTRINGENT, in medicine, the fame with astringent. See Astringents.

RESTRICTIVE, in medicine, a term used by antiquaries, for such medals as were struck by the emperors, to retrieve the memory of their predecessors.

Hence, in several medals we find the letters rest. This practice was first begun by Claudius, by his striking on six several medals of Augustus. Nero did the fame; and Titus, after his father's example, struck restitutions of molt of his predecessors. Gallicius struck a general restitution of all the preceding emperors, on two medals, the one bearing an altar, the other an eagle, without the rest.

RESTAURATION, the adl of re-establishing or setting a thing into its former good state.

RESTITUTION of medals, or Restituted medals, is a term used by antiquaries, for such medals as were struck by the emperors, to retrieve the memory of their predecessors.

Hence, in several medals we find the letters rest. This practice was first begun by Claudius, by his striking on six several medals of Augustus. Nero did the same; and Titus, after his father's example, struck restitutions of most of his predecessors. Gallicius struck a general restitution of all the preceding emperors, on two medals, the one bearing an altar, the other an eagle, without the rest.

RESTATIVE, or Resty, in the manage, a flubborn, unruly, ill-broken horse, that hops, or runs back, instead of advancing forward.

RESTORATION, the fame with restitution. See Restoration.

RETINUE, the attendants or followers of a prince or person of quality, chiefly in a journey.

RETIRADe, in fortification, a kind of retreatment made in the body of a bastion, or other work, which is to be disputed, inch by inch, after the defences are dismantled. It usually consists of two faces, which making a re-entering angle, when a breach is made in a bastion, the enemy may also make a retirade or new fortification behind it.

RETLINGEN, an imperial city of Germany, in the circle.
of Swabia and duchy of Württemberg, situated in E. long. 9°, N. lat. 48° 18'.

RETOUR, in chemistry. See Chemistry, p. 112.

RETRACTS, among horsemen, pricks in a horse's feet, arising from the fault of the Farrier in driving nails that are weak, or in driving them ill-pointed, or otherwise amiss.

RETRACEMENT, literally signifies something cut off or taken from a thing; in which sense it is the same with subtractions, diminution, &c.

Retrenchment, in the art of war,—any kind of work to prevent or hinder the enemy. See Fortification.

RETRACINGENTS, in natural history, a class or division of animals, whose characteristic it is that they have, or make water, backwards, both male and female.

REVE, Reeve, or Greve, the bailiff of a franchise, or jurisdiction of the crown, thus called, especially in the west of England.

REVEILLE, a beat of drum about break of day, to give notice that it is time for the soldiers to arise, and that the sentries are to forbear challenging.

REVEL, a port-town of Livonia, situated at the southern extremity of the gulph of Finland: E. long. 24° 8', N. lat. 59°.

REVELATION, the act of revealing, or making a thing public that was before unknown: it is also used for the discoveries made by God to his prophets, and by them to the world; and more particularly for the books of the Old and New Testament. See Bible and Religion.

Revelation of St. John. See Apocalypse.

REVELS, entertainments of dancing, masquerades, acting comedies, farces, &c. anciently very frequent in the inns of court, and in noblemen's houses, but now much diminished. The officer who has the direction of the revels at court, is called the master of the revels.

REVENUE, the annual income a person receives from the rent of his lands, houses, interest of money in the stocks, &c.

Revenue, in hunting, a fleshly lump formed chiefly of a cluster of whitish worms on the head of deer, supposed to occasion their calling their horns by gnawing them at the roots.

Reverberation, in physics, the act of a body repelling or reflecting another after its impinging thereon.

Reverberation, in chemistry, denotes a kind of circulation of the flame by means of a reverberatory. See Chemistry, p. 112.

REVOLVATION, in politics, signifies a grand change or revolution in government. In which sense the revolution is used, by way of eminence, for the great turn of affairs in England, in the year 1688, when King James II. abdicated the throne, the prince and princess of Orange were declared king and queen of England, &c. In geometry, the revolution of any figure, is its motion quite round a fixed line, as an axis.

The revolution of a planet, or comet, round the sun, is nothing but its course from any point of its orbit till its return to the same. See Astronomy.

REVULSION, in medicine, turning a flux of humours from one part to another, by bleeding, cupping, friction, sinapisms, blisters, lacerations, bathings, astringents, fomenting or purging of the bowels, &c. See Medicine.

REYGATE, or Rygate, a borough of Surrey, twenty-two miles south-west of London. It sends two members to Parliament.

REZANSKOI, the capital of the province of Rezan, in Russia; east long. 41°, north lat. 55°.

RHAGADES, in medicine, denotes chaps or clefts in any part of the body; arising either from any aridity of the parts, or acrimony of the humours.

RHAMNUS, in botany, a genus of the pentandria monogynia class. The calyx is tubulose, the corolla of five petals, the fruit is a beiry.

RHAPSODY, in antiquity, a discourse in verse sung or performed on the theatres, and sometimes sung the Iliad, and in others the Odyssey, and in blue when they sung the Odyssey. They performed on the theatres, and sometimes strove for prizes in contests of poetry, singing, &c. But there seems to have been other rhapsodies of more antiquity than those people, who composed heroic poems or songs in praise of heroes and great men, and sung their own compositions from town to town for a livelihood, in which profession Homer himself is said to be.

Rhapsodi, rhapsodist, in antiquity, persons who made a busines of singing pieces of Homer's poems. Cuper informs us, that the rhapsodi were cloathed in red when they sung the Iliad, and in blue when they sung the Odyssey. They performed on the theatres, and sometimes strove for prizes in contests of poetry, singing, &c. But there seems to have been other rhapsodies of more antiquity than those people, who composed heroic poems or songs in praise of heroes and great men, and sung their own compositions from town to town for a livelihood, of which profession Homer himself is said to be.

Rhapsody, in antiquity, a discourse in verse sung or performed by a rhapsodist. Others will have rhapsody
to signify a collection of verses, especially those of Homer, which having been a long time dispersed in pieces and fragments, were at length by Pindar's order, digested into books called rhapsodies. Hence, among moderns, rhapsody is also used for an assemblage of passages, thoughts, and authorities, raked together from diverse authors, to compose some new piece.

RHE, or REE, a little island in the bay of Biscay, near the coast of Anzin in France: W. long. 1° 30', N. lat. 49° 14'.

RHEIMS, or REIMS, a city of France, capital of the province of Champagne, one of the most elegant cities in France, situated seventy-five miles north-east of Paris: E. long. 4°, N. lat. 49° 20'.

RHETERIANS, a sect of heretics in Egypt, so denominating from Rhetorius their leader. The distinguishing doctrine of this heresiarch, as represented by Philalethus, was, that he approved of all the heresies before him, and taught that they were all in the right.

RHETORIC, the art of speaking copiously on any subject, with all the advantage of beauty and force.

Lord Bacon defines rhetoric: 'very philosophically, to be the art of applying and addressing the dictates of reason to the fancy, and of recommending them there as to affect the will and desires. The end of rhetoric, the same author observes, is to fill the imagination with ideas and images which may allure nature without oppressing it. Vellius defines rhetoric: 'The faculty of discovering what every subject affords of use for persuasion. Hence, as every author must invent arguments to make his subject prevail; dispose those arguments, thus found out, in their proper places; and give them the embellishments of language proper to the subject; and, if this discourse be intended to be delivered in public, utter them with that decency and force which may strike the hearer; rhetoric becomes divided into four parts, invention, disposition, elocution, and pronunciation.'

Rhetoric and oratory differ from each other as the theory from the practice; the orator being he who describes the rules of eloquence, and the orator he who uses them to advantage. Ordinarily, however, the two are used indifferently for each other. See Composition.

RHEUM, a thin serous humour, occasionally oozing out of the glands about the mouth and throat.

RHEUM in botany. See Botany, p. 642.

RHEUMATISM, in medicine. See Medicine, p. 124.

RHEUMATISM, in medicine. See Medicine, p. 124.

RHEXIA, in botany, a genus of the dodecandria monogynia class. The calyx consists of four segments, and the corolla of four petals, inserted into the calyx; the antheres are declined; and the capsule has four cells. There are three species, none of them natives of Britain.

RHINANTHUS, in botany, a genus of the dactylium angiospermae class. The calyx is twilled, and has four segments; the capsule is oblong, compressed, and bilocular. There are six species, only one of which, viz. the crista-galli, yellow rattle, or cock scomb, is a native of Britain.

RHINOCEROS, in zoology, a genus of quadrupeds belonging to the order of.bizones, of which there is but one species, viz. the unicorn, a native of Africa and India. It has two fore-teeth in each jaw, situated at a great distance from each other, and blunt, and a solid conical horn upon the nose. This, of all quadrupeds, approaches nearest to the elephant in size, the body being nearly as bulky, but the legs much shorter. A full-grown rhinoceros is fourteen feet high; and the legs are so short with all this height, that the belly comes near the ground: the head is very large and oblong, of an irregular figure, broad at top, and depressed towards the snout; the ears resemble those of a hog; the eyes are very small, and situated at a small distance from the extremity of the snout: on the upper part of the snout, near the extremity, flanks the horn, growing to about two feet and a half in length, bent a little back, of a black colour, and valetly firm and hard: the skin is remarkably thick and hard, so that the creature could not turn its body in any direction but for the joints and folds in it: the tail is short, and furnished with some long and extremely thick black hairs. The rhinoceros feeds upon thorns and brushwood; like the sow, he wallows in the mire. He is gentle and inoffensive, except when he is injured. But, when irritated, he even overturns large trees in his fury.

RHINOCEROS BIRD. See Buceros.

RHIZOPHORA, in botany, a genus of the dodecandria monogynia class. Both calyx and corolla consist of four segments; and there is but one long seed, siliqua at the base. The species are seven, none of them natives of Britain.

RHODES, the capital of an island of that name. Situated in the Mediterranean sea, in E. long. 28°, and between 36° and 37° N. lat.

RHODODENDRUM, in botany, a genus of the decapetrae clasa. The calyx of the male consists of four segments, and the corolla of four petals; the calyx of the female has four segments; it has no corolla, but four nectaria, and four pistils; and it has four capsules, containing many seeds. There is but one species, viz. the rose, or rose-wort, a native of Britain.

RHODODENDRUM, in botany, a genus of the decapetrae class. The calyx of the male consists of four segments, and the corolla of four petals; the calyx of the female has four segments; it has no corolla, but four nectaria, and four pistils; and it has four capsules, containing many seeds. There is but one species, viz. the rose, or rose-wort, a native of Britain.
RIB (552) RIB

dria monogynia class. The calix has five segments; the corolla is somewhat funnel-shaped; the stamens are declined; and the capsule has five cells. There are six species, none of them natives of Britain.

RHOMBODES, in geometry, a quadrilateral figure whose opposite sides and angles are equal, but is neither equilateral nor equiangular.

RHOMBOSIDES in anatomy. See Anatomy, p. 193.

RHOMBOSIDIA, in natural history, the name of a genus of fards, given them from being of a rhomboidal form.

RHOMBUS, in geometry, an oblique-angled parallelogram, or a quadrilateral figure whose opposite sides are equal and parallel, but the angles unequal, two of the opposite ones being obtuse, and the other two acute.

RHOMBUS, in ichthyology. See Pleuronectes.

RHONE, one of the largest rivers in France; which rising in one of the Alps of Switzerland, passes through the lake of Geneva, visits that city, and then runs south-west to Lyons, where joining the river Soane, it continues its course due south, falling by Orange, Avignon, and Arles, and falls into the Mediterranean a little westward of Marseilles.

RUBARB. See Botany, p. 642.

RHUMB, RUM, or RUM, in navigation, a vertical circle of any given place, or the intersection of such a circle with the horizon; in which last sense, rhumb is the same with a point of the compass. See Navigation.

RHUMB LINE, is also used for the line which a ship describes when sailing in the same collateral point of the compass, or oblique to the meridians. See Navigation.

RHUS, in botany, a genus of the pentandria trigynia class. The calix has five segments; the corolla is somewhat funnel-shaped; the stamens are declined; and the capsule has five cells. There are six species, none of them natives of Britain.

RHYME. in music, the variety in the movement, as to the quickness or slowness, length or thorough, of the notes. Or it may be defined more generally, the proportion which the parts of the motion have to each other. See Music.

RIBBAN, or RIBBON, in heraldry, the eighth part of a bend, like that represented in Plate CXLVII. fig. 10.

RIBBAND, or RIBBON, a narrow sort of silk, chiefly used for head-ornaments, badges of chivalry, &c.

RIBES, in botany, a genus of the pentandria monogynia class. It has five stamens, and five petals, both inserted into the calix; the style is bifid, and the berry contains many seeds. There are eight species, three of them natives of Britain, viz. the rubrum, or currants; the alpinum, or black currants; and the nigrum, or black currants.

RIBS, in anatomy. See Anatomy, p. 173.

RICCIA, in botany, a genus of the cryptogamia algae class.

RICHARDIA, in botany, a genus of the hexandria monogynia class. The calyx has six segments, and the corolla one subcyllindrical petal; and the seeds are three. There is but one species, a native of Vera Cruz.

RICHELIEU, a town of France, in the province of Orleans, in territory of Poitiers, situated twenty-six miles north of Poitiers.

RICHMOND, a village in the county of Surry, ten miles west of London, formerly the residence of the kings of England.

RICHMOND is also a borough town of Yorkshire, thirty-three miles north-west of York. It sends two members to parliament.

RICHNUS, in botany, a genus of the monce da monadelphia class. The calyx of the male has five segments; it has no corolla, but the stamens are numerous. The calyx of the female has three segments; it has no corolla; the stamens are three, and bifid; and the capsule has three cells, and one seed. There are three species, none of them natives of Britain.

RICKETS, in medicine. See Medicine, p. 160.

RIDGE, in agriculture, a long piece of rising land, between two furrows. See Agriculture, p. 57.

RIDGING, or RIDGE, among farriers, &c. the male of any beast that has been but half gelt.

RIDICULE, in matters of literature, is that species of writing, which excites contempt with laughter.

RIDING, a division of Yorkshire; of which there are three, viz. the east, west, and north ridings.

In all induftries in that county, both the town and riding must be expressed.

RIEF, in Scots law. See Robbery.

RIGA, a port-town of Livonia, one of the best harbours and trading towns in the Baltic: E. long. 24°, N. lat. 57°.

RIGGING of a ship is all her cordage and ropes, belonging to her masts, yards, &c.

RIGHT, in geometry, signifies the same with a straight line.

RIGIDITY, in physics, denotes a brittle hardnes. It is opposed to delicacy, malleability, and softness.

RIVER, in medicine, a convulsive shuddering, from severe cold, an ague-fit, or other disorder.

RIMINI, a port town of Italy, in the territories of the pope, and province of Rome, situated on the gulf of Venice: E. long. 13° 30', and N. lat. 44° 8'.

RING, the skin of any fruit that may be cut off or pared. Rind is also used for the inner bark of trees, or that whitish soft substance which adheres immediately to the wood.

RING, an ornament of gold, silver, &c. made of a circular form, and generally worn on the finger.

RING-BONE, in farriery, a hard callous substance, growing in the pattern of a horse, above the coronet: it is thus called from its growing quite round like a ring. See Farriery.
ROB, in pharmacy, the juices of fruits purified and purified till it is of the consistency of honey. 

ROANOAK, an island in North America, near the coast of Albermarle-county, in North Carolina: W. long. 75°, N. lat. 35° 40'.

ROB OF ALDER-BERRIES is thus prepared: Take two quarts of the juice of ripe alder-berrries, and half a pound of refined sugar. Evaporate over a gentle fire, or in a water bath, till it is of a due consistence.

ROBINIA, in botany, a genus of the diadelphia decandra class. The vexillum is open, reflexed, and roundish; the vexillum has four teeth, the uppermost being emarginated. There are six species, none of them natives of Britain.

ROBOANTS, in pharmacy, medicines which strengthen the parts, and give new vigour to the constitution.

ROCHEFOCAUT, a town of Orleans, in France, fifteen miles east of Angoulême.

ROCHELLE, a city and port-town of Orleans, in France; and one of the flations of the French navy, having a commodious harbour, well secured by forts and batteries. 

ROCHEFORD, a market-town of Essex, thirty-three miles east of London, and fifteen south-east of Chelmsford.

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ROCHFORT, a port-town of Guinne, in France, twenty-three miles south of Rochelle: W. long. 1° 5', N. lat. 46° 7'.

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ROHAN, a town of France, in the province of Bntany.

Rogation week, the week immediately preceding Whit-week.

ROELLA, in botany, a genus of the pentandria monogy-

nia class. The corolla is funnel-shaped; the stigma is bifid; and the capsule is cylindrical, and has two cells. The species are two, none of them natives of Britain.

ROER, the name of two rivers in Germany, one of which rises on the confines of Heife, and falls into the Rhine; a little below Duyburg; the other rises in the duchy of Juliers, and falls into the Meafe at Roermond.

ROGA, in antiquity, a present which the emperors made to the senators, magistrates and even to the people; and the popes or patriarchs to their clergy.

These rogues were distributed by the emperors on the first day of the year, on their birth day, or on the natalis dies of the cities; and by the popes and patriarchs, in passion-week.

Roga is also used for the common pay of the soldiers.

ROGATION, in the Roman jurisprudence, a demand made by the consuls or tribunes of the Roman people, when a law was proposed to be passed. Rogatio is also used for the decree itself made in consequence of the peoples giving their assent to this demand, to distinguish it from a senatorial-consultum, or decree of the senate.

ROGATION WEEK, the week immediately preceding Whit-sunday, so called from the three days therein, on Monday, Tuesday, and Wednesday, which are also called rogations, or rogation days, from the extraordinary prayers and supplications at this time offered to God by devout Christians to appease his anger and depreciate his judgments.

ROGUE, in law, an idle sturdy beggar; who by ancient statutes is for the first offence called a rogue of the first degree, and punished by whipping, and boring through the gristle of the right ear with a hot iron; and for the second offence, is termed a rogue of the second degree, and, if above eighteen-years of age, ordered to be executed as a felon.

ROHAN, a town of France, in the province of Brittany, situated twenty miles north of Vannes.

ROLL, in manufacturies, something wound and folded up in a cylindrical form.

Roll, in law, signifies a schedule or parchment which may be rolled up by the hand into the form of a pipe.

Mafter-roll, that in which are entered the soldiers of every troop, company, regiment, &c.

Rolls-office, is an office in Chancery-lane, London, appointed for the custody of the rolls and records in chancery.

Rols of parliament, are the manuscript registers, or rolls of the proceedings of our ancient parliaments, which, before the invention of printing, were all engrossed on parchment, and proclaimed openly in every county. In these rolls are also contained a great many decisions of difficult points of law, which were frequently in former times referred to the decision of that high court.

Roll, or roller, is also a piece of wood, iron, brass, &c. of a cylindrical form, used in the construction of several machines, and in several works and manufacturies.

ROMAN, in general, something belonging to the city of Rome. See Rome.

King of the Romans, in modern history, is a prince elected to be successor to the reigning emperor of Germany.

ROMANCE, in matters of literature, a fabulous relation of certain adventures designed for the entertainment and instruction of the readers.

The true nature and genuine characteristics of this species of writing are excellently explained by the ingenious author of the Rambler; who observes, that the works of fiction, with which the present generation seems more particularly delighted, are such as exhibit life in its true flate, diversified only by the accidents that daily happen in the world, and influenced by those passions and qualities which are really to be found in conversing with mankind.

ROMANIA, a province of the pope's territories in Italy, including the Bolognese and Ferrarese. See Bologna and Ferrara.

ROMANIA, is also the modern name of ancient Thrace, which now makes a province of Turkey in Europe; lying wellward of the Propontis, between the Euxine Sea and the Archipelago.

ROME, the capital of the pope's territories and of Italy, and anciently the mistress of the Roman Empire; E. lon. 13°, N. lat. 41° 45'.

Rome is still a large and fine city, though not to be compared to ancient Rome; the streets are spacious, and magnificently built; it has five bridges over the Tiber, twenty gates, three hundred churches, and a vast number of palaces, convents, triumphal arches, pillars, obelisks, statues, theatres, &C.

ROMNEY, a borough town of Kent, and one of the five ports, situated twelve miles south-west of Dover. It lends two members to parliament.

ROMPEE, or Rompu, in heraldry, is applied to ordina-

ries that are represented as broken, and to chevrons, bends, or the like, whose upper points are cut off. See Plate CXLVII, fig. 11.

RONDELETIA, in botany, a genus of the pentandria monogy-

nia class. The corolla is funnel-shaped, and the capsule has two cells containing many round coronated seeds. There are two species, none of them natives of Britain.

ROOD, a quantity of land equal to forty square perches, or the fourth part of an acre.

ROOF, in architecture, the uppermost part of a building. See Architecture, p. 361.

ROOK, in ornithology. See Corvus.

ROOM, a chamber, parlour, or other apartment, in a house. See Architecture, p. 359.

ROOT, among botanists, denotes that part of a plant which imbibles the nutritious juices of the earth, and transmits them to the other parts. See Agriculture, p. 42.

Root, in algebra and arithmetick. See Algebra, p. 84, &c. and Arithmetic, p. 420.

ROPE, hemp, hair, &c. spun out into a thick yarn, and then several strings of this yarn twisted together by means of a wheel. When made very small, it is called a cord; and when very thick, a cable.

Rope yarn, among sailors, is the yarn of any rope untwist-

ed, but commonly made up of junk; its use is to make fennet, mats, &c.

ROSA, in botany, a genus of the icofandria polygamia class.

The petals are five; the calyx has five fleshy segments; and the seeds are numerous, rough, and inserted into the interior side of the calyx. There are 14 species, five of them natives of Britain, viz. the glannteria, or sweet briar; the spimalfluma, or burnet rofe; the arvensis, or white-flowered dogs-rose; the vullofa, or apple-rose; and the canina, or red-flowered dogs-rose, or hip-tree.

ROSA-
with it, only by removing them into broom-fields. Scurvy-grafs, mugwort, parsley, and thyme, are also good for the prevention of it.

ROTA, the name of an ecclesiastical court at Rome, composed of twelve prelates, whereof one must be a German, another a Frenchman, and two Spaniards; the others are Italians, three of whom must be Romans, and the other five a Bolognese, a Ferraran, a Milanese, a Venetian, and a Tuscan.

This is one of the most august tribunals in Rome, which takes cognizance of all suits in the territory of the church, by appeal; as also of all matters beneficary and patrimonial.

ROTATION, in geometry, a term chiefly applied to the circumvolution of any surface round a fixed and immovable line, which is called the axis of its rotation: and by such rotations it is, that solids are conceived to be generated.

ROTHERAM, a market-town of York, twenty-two miles west of York.

ROTHSAY, a parliament-town of Scotland, on the island of Bute; W. long. 5°, and N. lat. 55° 50'.

ROTONDO, or Rotondo, in architecture, an appellation given to any building that is round both within and without side, whether it be a church, a saloon, or the like. The most celebrated rotondo of the ancients, is the pantheon at Rome.

ROTENNESS. See Putrefaction.

ROTTERDAM, a city of the province of Holland, situated on the north bank of the Meuse, thirty miles south of Amsterdam, and thirteen miles south-east of the Hague; E. long. 4° 20', and N. lat. 52°.

ROTONDA, in anatomy, See Anatomy, p. 185.

ROUNDHOUSE, a kind of prison, for the nightly watch in London to secure disorderly persons, till they can be carried before a magistrate.

ROUSILLON, formerly a province of Spain, now united to France, is bounded by Languedoc on the north, by the Mediterranean sea on the east, by Catalonia on the south, and by the Pyrenean mountains on the west, being about fifty-five miles long, and thirty-six broad.
ROUTE, a public road, highway, or course, especially that which military forces take. This word is also used for the defeat and flight of an army.

Rout, in law, is applied to an assembly of persons, going forcibly to commit some unlawful act, whether they execute it or not.

ROWEL, among farriers, a kind of issue, made by drawing a flain of silk, thread, hair, or the like, through the nape of the neck, or other part of a horse; answering to what in surgery is called a feron. See Farriery.

ROYALTON, a market-town, situated in the counties of

ROYENA, in botany, a genus of the decandria digynia class.

ROYAL, something belonging to a king; thus we say, royal family, royal affent, royal exchange, &c.

ROYAL-oak, a fair spreading tree at Boscobel, in the parish of Donnington in Staffordshire, the boughs whereof were once covered with ivy; in the thick of which king Charles II. fat in the day time with colonel Careless, and in the night lodged in Boscobel house: so that they are mistaken who speak of it as an old hollow oak, it being then a very flourishing tree, surrounded with more. The poor remains thereof are now fenced in with a handsome wall, with this inscription over the gate in gold-letters: Felicitatum arboris quam in vos, while potentissimi regis Caroli II. Deus op. max. per quem reges regnant, hic crescre votuit. See.

ROYAL-fociety. See Society.

ROYALTIES, the rights of the king, otherwise called the king's prerogative, and the regalia. See Prerogative, and Regalia.

ROYENA, in botany, a genus of the decandria digynia class. The calix is urceolate; the corolla consists of one bell-shaped petal; and the berry contains one seed. There are three species, all natives of the Cape of Good Hope.

ROYSTON, a market-town, situated in the counties of Hertford and Cambridge, thirty-eight miles north of London.

RUBELLIO, in ichthyology. See Cyprinus.

RUBETA, in zoology. See Rana.

RUBIA, in botany, a genus of the tetrandria monogynia class. The corolla consists of one bell-shaped petal; and the berry contains one seed. There are two species, none of them natives of Britain.

RUBIGALIA, in antiquity, a feast celebrated by the Romans, in honour of the god Rubigus, or the goddess Rubiga, to engage these deities to preserve the corn from Mildew, being a species of blight. See Blight.

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RUBIC, in the canon-law, signifies a title or article in certain ancient law-books; thus called because written, as the titles of the chapters in our ancient Bibles are, in red letters.

RUBUS, in botany, a genus of the icofandria polygynia class. The calix consists of five segments, and the corolla of five petals; and the berry has many seeds. There are 13 species, five of them natives of Britain, viz., the idee-, or raspberry-bush, the caesius, or small bramble; the fruticosus, or common bramble; the saxatilis, or stone-bramble; and the chamaemorus, or cloud-berries.

RUBIA, in botany, a genus of the tetrandria monogynia class. The receptacle is conical and furnished with many more. The poor remains thereof are now fenced in with a handsome wall, with this inscription over the gate in gold-letters: Felicitatum arboris quam in vos, while potentissimi regis Caroli II. Deus op. max. per quem reges regnant, hic crescre votuit. See.

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RUBY, in natural history, a species of gems, being a beautiful gem of a red colour with an admixture of purple.

This, its most perfect and bell-coloured stone, is a gem of prodigious beauty and extreme value; it is often found perfectly pure and free from blemishes or faults, but much more frequently debased greatly in its value by them, especially in the larger specimens. It is of very great hardness, equal to that of the sapphire, and second only to the diamond. It is various in size, but left subject to variations in its shape than most of the other gems. It is usually found very small, its most common size being equal to that of the head of the largest sort of pins; but it is found of four, eight, or ten carats, and sometimes, though very rare, up to twenty, thirty, or forty. It is never found of an angular or crystalliform shape, but always a pebble-like figure, often roundish, sometimes oblong and much larger at one end than at the other, and in some form resembling a pear, and is usually flattened on one side. It commonly is naturally fo bright and pure on the surface, as to need no polishing; and when its figure will admit of being set without cutting, it is often worn in its rough state, and with no other than its native polish.

We have the true ruby only from the East Indies; and the principal mines of it are in the kingdom of Pegu and the island of Ceylon.

Ruby, in heraldry, denotes the red colour wherewith the arms of noblemen are blazoned; being the same which, in the arms of those not noble, is called, gules. See Gules.

RUCTATION, a ventosity arising from indigestion, and discharging itself at the mouth with a very disagreeable noise.

RUDBECKIA, in botany, a genus of the syngenia polygynia fruiticana class. The receptacle is conical and palaeaceous: the pappus has four teeth on its edge; and the berry discharges itself at the mouth with a very disagreeable noise.
RUGEN, an island of the Baltic sea, on the coast of Germany, being part of the duchy of Swedish Pomerania, separated from the continent by a narrow channel: this island is thirty miles long, and near as many broad.

RUGER, a term particularly used for magnificent buildings fallen into decay by length of time, and whereof there only remains a confused heap of materials.

RULE, in matters of literature, a maxim, canon, or precept, to be observed in any art or science.

Rule of three. See Arithmetick, p. 331.

RUM, a species of brandy or vinous spirit, distilled from sugar-canes.

Rum, according to Dr. Shaw, differs from simple sugar-spirit, in that it contains more of the natural flavour or essentiel oil of the sugar-cane; a great deal of raw juice and parts of the cane itself being often fermented in the liquor or solution of which the rum is prepared. The unctuous or oily flavour of rum is often supposed to proceed from the large quantity of fat used in boiling the sugar; which fat, indeed, if coarse, will usually give a flinking flavour to the spirit, in our distillations of the sugar liquor, or wash, from our refining sugar-houses; but this is nothing of kin to the flavour of the rum, which is really the effect of the natural flavour of the cane.

The method of making rum is this: When a sufficient stock of the materials is got together, they add water to them, and ferment them in the common method, though the fermentation is always carried on very slowly at first; because at the beginning of the season for making rum in the islands, they wait yeast, or some other ferment to make it work; but by degrees, after this, they procure a sufficient quantity of the ferment, which rises up as a head to the liquor in the operation; and thus they are able afterwards to ferment and make their rum with a great deal of expedition, and in large quantities.

When the wash is fully fermented, or to a due degree of acidity, the distillation is carried on in the common way, and the spirit is made up proof: though sometimes it is reduced to a much greater strength, nearly approaching to that of alcohol or spirit of wine, and it is then called double-distilled rum. It might be easy to rectify the spirit, and bring it so much greater purity than we usually find it to be of: for it brings over in the distillation a very large quantity of the oil; and this is often so disagreeable, that the rum must be suffered to lie by a long time to mellow before it can be used; whereas, if well rectified, it would grow mellow much sooner, and would have a much less potent flavour.

The best state to keep rum in, both for exportation and other uses, is double distillation of alcohol, or rectified spirit. In this manner it would be transported in one half the bulk it usually is, and might be let down to the common proof-strength with water when necessary; for the common use of making punch, it would likewise serve much better in the state of alcohol; as the taste would be cleaner; and the strength might always be regulated to a much greater exactness than in the ordinary way.

The only use to which it would not so well serve in this state, would be the common practice of adulteration among our distillers; for when they want to mix a large portion of cheaper spirit with the rum, their business is to have it of the proof-strength, and as full of the flavouring oil as they can, that it may drown the flavour of the spirits they mix with it, and extend its own. If the business of rectifying rum was more nicely managed, it seems a very practicable scheme to throw out so much of the oil, as to have it in the fine light state of a clear spirit, but lightly impregnated with it; in this case it would very nearly resemble arrack, as is proved by the mixing a very small quantity of it with a tasteless spirit, in which case the whole bears a very near resemblance to arrack in flavour.

Rum is usually very much adulterated in England: some are so bare-faced as to do it with malt-spirit; but when it is done with molasses spirit, the tasts of both are so nearly allied, that it is not easily discovered. The best method of judging of it is, by letting fire to a little of it; and when it has burnt away all the inflammable part, examining the phlegm both by the taste and smell.

RUMELIA, in geography, the name of ancient Greece, now a part of Turkey in Europe.

RUMEN, the paunch, or third stomach of such animals as chew the cud, whence called ruminant animals.

The rumen is by far the largest of all the stomachs, and in it the whole mists of crude aliments, both solid and liquid, lies and macerates, to be thence transmitted to the mouth to be again chewed, comminuted, and fitted for farther digestion in the other ventricles.

RUMEX, in botany, a genus of the hexandria trigynia class. The calix has three leaves, and the corolla three connivent petals; and there is but one triangular seed.

The species are 27, of which ten are natives of Britain.

RUMFORD, a market-town of Essex, ten miles east of London.

RUNGS, in a ship, the same with the floor or ground timbers, being the timbers which constitute her floor, and are bolted to the keel, whose ends are rung-heads.

Rung-heads, in a ship, are made a little bending, to direct the sweep or mold of the futtocks and navel timbers; for here the lines, which make the compass and bearing of a ship, do begin.

RUNIC, a term applied to the language and letters of the ancient Goths, Danes, and other northern nations.

RUNNER, in the sea-language, a rope belonging to the garnet, and to the two bolt-tackles. It is received in a single block, joined to the end of a pennant, and has at one end a hook to hitch into any thing, and at the other end a double block, into which is received the fall of the tackle, or the garnet, by which means it purchases more than the tackle would without it.

RUNNET, or Rennet, the acid juice found in the stomachs of calves that have fed on nothing but milk, and are killed before the digestion is perfect. It curdles milk.

RUPERT’S drops, a sort of glass-drops with long and slender tails, which burn to pieces on the breaking off the ends in any part, said to have been invented by prince Rupert, and therefore called after his name. This surprising phenomenon is supposed to rise from hence, that while the glass is in fusion, or in a melted state, the particles of it are in a state of repulsion; but being dropped into cold water, it coagulates the particles in the external parts of their superficies, that they are easily reduced.
RUPTURE, in surgery. See Surgery.

RUPICAPRA, in zoology. See Capra.

RUSCUS, butcher's broom, in botany, a plant of the dicotyledonous class. The calyx of the male consists of six leaves; it has no corolla; the nectarium is central, oval, and perforated at the top; the calyx, corolla, and nectarium of the female are the same with those of the male; it has one style; and the berry has three cells, and two seeds. There are five species, only one of them, viz. the aculeatus, knee-holly, or butcher's broom, a native of Britain.

RUSTIC, in architecture, implies a manner of building in imitation of nature, rather than according to the rules of art. See Architecture.

RUTICILLA, in ornithology. See Muscicapa.

RUTICILLIUS, in ichthyology. See Cyprinus.

RUTLAND, the least county in England, bounded by Lincolnshire on the north-east, by Northamptonshire on the north-west, and by Leicestershire on the west and north-west.

SAB, in church-history, a sect of idolaters, much ancienester than the Jewish law.

SABA, one of the Caribbee islands, subject to the Dutch: W. long. 63°, N. lat. 18°.

SABAEANS, in church-history, a sect of idolaters, much ancienester than the Jewish law.

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SABBELLIANS, an sect of the 2nd century, that embraced the opinions of Sabellius, a philos-

phier of Egypt, who openly taught that there is but one person in the Godhead.

SABBATH, or the day of rest, a solemn festival of the Jews, on the seventh day of the week, or Saturday, beginning from sun-fan on Friday, to sun-fet on Saturday.

The observation of the Sabbath began with the world: for God having employed six days in its creation, appointed the seventh as a day of rest to be observed by man, in commemoration of that great event. On this day the Jews were commanded to abstain from all labour, and to give rest to their cattle. They were not allowed to go out of the city farther than two thousand cubits; or a mile; a custom which was founded on the diligence of the ark from the tents of the Israelites, in the wilderness, after their leaving Egypt; for being permitted to go, even on the sabbath day, to the tabernacle to pray, they from thence inferred, that the taking a journey of no greater length, than on a different account, could not be a breach of the sabbatical rest.

As the seventh day was a day of rest to the people, so was the seventh year to the land; it being unlawful in this year to plow or sow, and whatever the earth produced belonged to the poor: this was called the sabbatical year. The Jews, therefore, were obliged, during the six years, and more especially the last, to lay up a sufficient store for the sabbatical year.

The modern, as well as the ancient, Jews, are very superstitious in the observance of the sabbath; they carry neither arms, nor gold nor silver about them, and are permitted neither to touch thefe, nor a candle, nor any thing belonging to the fire; on which account they light up lamps on Friday, which burn till the end of the sabbath.

SABBELLIANS, a sect of Chriftians of the 2nd century, that embraced the opinions of Sabellius, a philos-

philosopher of Egypt, who openly taught that there is but one person in the Godhead.

The Sabellians maintained, that the Word and the Holy Spirit are only virtues, emanations, or functions of the Deity: and held, that he who is in heaven is the Father of all things, descended into the virgin, became a child, and was born of her as a son; and that having accomplished the mystery of our salvation, he diffused himself on the apostles in tongues of fire, and was then denominated the Holy Ghost. This they explained by resembling God to the sun, the illuminative virtue or quality of which was the Word, and its warming virtue

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the Holy Spirit. The Word, they taught, was darted, like a divine ray, to accomplish the work of redemption; and that, being ascended to heaven, the influences of the Father were communicated after a like manner to the apostles.

SABINA, in botany. See Juniperus.

SABINA, a province of Italy, in the pope's territories, bounded by Umbria on the north, by Naples on the south, and by St. Peter's Patrimony on the west.

SABLE, in heraldry, denotes the colour black, in coats of arms belonging to gentleman; but in those of noblemen it is called diamond; and in those of sovereign princes, Saturn. See Colour.

It is expressed in engraving by perpendicular and horizontal hatches crossing one another, as represented in Plate CXLVII. fig. 12.

SABLUSTAN, a province of Persia, which comprehending Gaur and Candalor, is bounded by Chorassan on the north, by India on the east, and by Sigishin on the south.

RABRE, a kind of sword or scimitar, with a very broad and heavy blade, thickest at the back, and a little falcated or crooked towards the point; it is the ordinary weapon worn by the Turks, who are said to be very expert in the use of it.

SABBURRE, grits, in natural history, a genus of fossils, found in minute masses, forming together a kind of powder, the several particles of which are of no determinate shape, nor have any tendency to the figure of crystall; but seem rudely broken fragments of larger masses; not to be dissolved or diluted by water, but retaining their figure in it, and not cohering by means of it into a mafs; considerably opaque, and in many species fermenting with acids; often fouled with heterogeneous matters, and not infrequently taken in the coarser ftony and mineral or metallic particles.

Grits are of various colours, as 1. The flinty or sparry grits, of a bright or greyish white colour. 2. The red flinty grits. 3. The green ftony grits, composed of homogenous sparry particles. 4. The yellow grits, of which there is only one species. 5. The black and blackish grits, composed of ftony or taly particles.

SACCACIDE, in the mange, is a sort more or less violent, given by the horfeman to the horfe, in pulling or twitching the reins of the bridle all on a sudden, and with one pull, and that when a horfe lies heavy upon the hand, or obstinately arms himself.

SACCAL, a city and port-town of Japan, situated on the bay of Mecao, three hundred miles south-west of Jeddo: E. long. 125°, and N. lat. 36.

SADRCHARUM, in botany, a genus of the triandria digynia clafs. It has no calyx, but long down in place of it; and the corolla has two valves. There are two species, both natives of India. See Sugar.

SACCARUM SATURNI, sugar of lead, is thus ordered to be made in the London Dispensatory; boil cerul with distilled vinegar, until the vinegar becomes sufficiently sweet; then filter the vinegar through paper, and after due evaporation let it to crystallize.

SACCULUS, in anatomy, a diminutive of fasciculus, signifies a little bag, and is applied to many parts of the body. See Anatomy.

7. B.
SACRED, something holy, or that is solemnly offered and consecrated to God, with benedictions, unctions, &c.

SACRAMENT, signifies, in general, a sign of a thing sacred and holy; and is defined to be an outward and visible sign of a spiritual grace. Thus there are two objects in a sacrament, the one the object of the senses, and the other the object of faith. Protevangelists admit only of two sacraments, baptism and the eucharist or Lord's supper; but the Roman Catholics own seven, viz. baptism, confirmation, the eucharist, penance, extreme unction, ordination, and marriage.

The Romanists, however, by way of eminence, call the eucharist the holy sacrament. Thus to expel the holy sacrament, is to lay the consecrated host on the altar to be adored. The procession of the holy sacrament, is that in which this host is carried about the church, or about a town.

SACRAMENTARY, an ancient Roman church-book, which contains all the prayers and ceremonies practiced at the celebration of the sacraments.

It was written by Pope Gelasius, and afterwards revised, corrected, and abridged by St. Gregory.

SACRED, something holy, or that is solemnly offered and consecrated to God, with benedictions, unctions, &c.

SACRIFICE, a solemn act of religious worship, which consists in dedicating or offering up something animate or inanimate on an altar, by the hands of the priest, either as an expression of their gratitude to the Deity for some signal mercy; or to acknowledge their dependence on him, or to conciliate his favor. The origin of sacrifices is by some ascribed to the Egyptians; but Popery ascribes it to the Egyptians, who first offered the first-fruits of their grounds to the gods, burning them upon an altar of turf: thus in the most ancient sacrifices there were neither living creatures, nor any thing corporeal, and no myrrh or frankincense. At length they began to burn perfumes; and afterwards men leaving their ancient diet of herbs and roots, and beginning to use living creatures for food, they began also to change their sacrifices. The scriptures, however, furnish us with a different account: for Noah, it is said, sacrificed animals at his coming out of the ark; and even Abel himself sacrificed the fatted and fattened of his flock; but Grotius thinks it more probable that he contented himself with making a mere oblation of his lambs, &c. without slaying them.

The Jews had two sorts of sacrifices, taking the word in its largest signification: The first were offerings of tythes, first-fruits, cakes, wine, oil, honey, and the like; and the last, offerings of slaughtered animals. When an Israelite offered a loaf or a cake, the priest broke it in two parts; and offering aside that half which he reserved for himself, broke the other into crumbs, poured oil, wine, incense, and salt upon it, and spread the whole upon the fire of the altar. If these offerings were accompanied with the sacrifice of an animal, they were thrown upon the victim to be consumed along with it. If the offerings were of the ears of new corn, they were parched at the fire, rubbed in the hand, and then offered to the priest in a vessel, over which he poured oil, incense, wine and salt, and then burnt it upon the altar, having first taken as much of it as of right belonged to himself.

The principal sacrifices among the Hebrews consisted of bullocks, sheep, and goats; but doves and turtle doves were accepted from those who were not able to bring the other; these, beasts were to be perfect, and without blemish. The rites of sacrificing were various, all of which are very minutely described in the books of Moses.

The manner of sacrificing among the Greeks and Romans was as follows. In the choice of the victim, they took care that it was without blemish or imperfection; its tail was not to be too small at the end; the tongue not black, nor the ears cleft; and that the bull was one that had never been yoked. The victim being pitched upon, they girt his forehead and horns, especially if a bull, heifer, or cow. The head they also adorned with a garland of flowers, a woollen infula or holy fillet, whence hung two rows of chaplets with twisted ribbands; and on the middle of the body a kind of flue, pretty large, hung down on each side: the lesser victims were only adorned with garlands and bundles of flowers, together with white tufts or wreaths.

The victims thus prepared were brought before the altar; the lesser being driven to the place, and the greater led by a halter; when if they made any struggle, or refused to go, the priest was taken for an ill omen, and the sacrifice frequently was let aside. The victim thus brought was carefully examined, to see that there was no defect in it: then the priest, clad in his ephod, and accompanied with the sacrificers and other attendants, and being washed and purified according to the ceremonies preferred, turned to the right-hand and went round the altar, sprinkling it with meal and holy-water, and also besprinkling those who were present. Then the crier proclaimed with a loud voice, Who is here? To which the people replied, Many and good. The priest then having enjoined the people to join with him by saying, Let us pray, confessed his own unworthiness, acknowledging that he had been guilty of divers sins; for which he begged pardon of the gods, hoping that they would be pleased to grant his requests, accept the oblations offered them, and send them all health and happiness; and to this general form added petitions for such particular favours as were then desired. Prayers being ended, the priest took a cup of wine; and having tasted it himself, caused his attendants to do the like; and then poured forth the remainder between the horns of the victim. Then the priest or the crier, or sometimes the most honourable person in the company, killed the beast, by
by knocking it down, or cutting its throat. If the sacrifice was in honour of the celestial gods, the throat was turned up towards heaven; but if the sacrifice to the heroes or infernal gods, the victim was killed with its throat towards the ground. If by accident the beast escaped the stroke, leaped up after it, or expired with pain and difficulty, it was thought to be unacceptable to the gods. The beast being killed, the priest inspected its entrails, and made predictions from them. They then poured wine, together with frankincense, into the fire, to increase the flame, and then laid the sacrifice on the altar; which in the primitive times was burnt whole to the gods, and thence called an holocaust; but in after-times, only part of the victim was consumed in the fire, and the remainder referred for the sacrificers; the thighs, and sometimes the entrails, being burnt to their honour, the company feated upon the reit. While the sacrifice was burning, the priest, and the person who gave the sacrifice, jointly prayed, laying their hands upon the altar. Sometimes they played upon musical instruments in the time of the sacrifice, and on some occasions they danced round the altar, singing sacred hymns in honour of the gods.

Sacrifice, is also a name of an island in the gulf of Mexico, forty-five miles east of La Vera Cruz; it is subject to the Spaniards.

Sacrilege, the crime of profaning sacred things, or those devoted to the service of God. See Sexton.

Sacrister, a church-officer, otherwise called sexton. See Sexton.

Sacristy, in church history, an apartment in a church, where the sacred utensils were kept; being the same with our vestry. See Vestry.

Sacro Lumbarlis, in anatomy. See Anatomy, p. 203.

Sacrum or S, in Anatomy, p. 170.

Saderasapatan, a port-town of the coast of Commandel forty miles south of Fort St George. Here the Dutch have a factory.

Saddle, is a seat upon a horse's back, contrived for the convenience of the rider.

A hunting saddle is composed of two bows, two bands, fore-boots, panels, and saddle-irons; and the great saddle has, besides these parts, corks, hind-boots, and a trough-quern.

The pomell is common to both.

Sadducees, in Jewish antiquity, a famous sect among the ancient Jews, so called from their founder Sadoc. Antigonus of Socho, president of the sanhedrim at Jerusalem, and teacher of the law in the divinity school of that city. Having often, in his lectures, afferted to his scholars, that they ought not to serve God in a servile manner, with respect to reward, but only out of filial love and fear; two of his scholars, Sadoc and Baitthus, inferred from thence, that there were no rewards or punishments after this life; and, therefore, separating from the school of their master, they taught that there was no resurrection, nor future state. Many embracing this opinion, gave rise to the sect of the Sadducees, who were a kind of Epicureans; but differing from them in this, that though they denied a future state, yet they allowed the world was created by the power of God, and governed by his providence; whereas the followers of Epicurus denied both.

The Sadducees denied all manner of predetermination whatever; and not only rejected all unwritten traditions, but also all the books of the Old Testament, excepting the Pentateuch.

Safeguard, a protection formerly granted to a stranger, who feared violence from some of the king's subjects, for seeking his right by course of law.

Saffron, in botany, &c. See Colchicum.

Meadow Saffron, in botany. See Colchicum.

Sagamen, in pharmacy, &c. A gum resin, brought to us in two forms: the inner and purer is in loose granules, or single drops; the coarser kind is in masses composed of these drops of various sizes, cemented together by a matter of the same kind. In either case, it is of a firm and compact consistence, considerably heavy, and of a reddish colour on the outside, brownish within, and spotted in many places with small yellowish or whitish specks. Its smell is strong and disagreeable: its taste acrid and unpleasing.

It is brought to us from Persia and the East-Indies.

Sagamen is a very great attenuant, aperient, and diffusent: it is good in all disorders of the breast that owe their origin to a tough phlegm.

Sage, in botany. See Salvia.

Sagene, a Russian long measure, five hundred of which make a verst: the sagene is equal to seven English feet.

Sagina, in botany, a genus of the tetrandria tetragynia class. The calyx consists of four leaves, and the corolla of four petals; the capsule has four cells, and four valves, containing many seeds. There are three species, two of them natives of Britain, viz. the procumbens, or pearl wort; and the erecta, or the least ditch wort.

Sagittaria, in botany. See Astronomical, p. 487.

Sagittalis suture, in anatomy. See Anatomy, p. 152.

Sagittaria, in botany, a genus of the monocata polyandra class. The calyx of the male consists of three segments, and the corolla of three petals; and the flamina are about 24. The calyx and corolla of the female are the same with those of the male; it has no pistillum; and the seeds are many, and naked. The species are four, only one of them, viz. the fagittifolia, or arrowhead, a native of Britain.

Sagittarius, in astronomy. See Astronomy, p. 487.

Sago, a simple brought from the East-Indies, of considerable use in diet as a restorative.

Sago is a sort of bread produced in the following manner, from a tree called landan, growing in the Moluccas. When a tree is flied, they cleave it in two in the middle, and dig out the pith, which is eatable, when it comes fresh out of the tree. They pound it in a mortar, till it is reduced into a kind of powder somewhat like meal. Then they put a piece made of the bark of the same tree, placing it over a cilkern made of its leaves, and pour water on it, which separates the pure part of the powder from the woody fibres wherewith the pith abounds. The flour thus filtrated they call fago, which they make into pate, and bake it in earthen furnaces.

Sagreed, in ichthyology. See Squalus.

Sail, in navigation, an assemblage of several breadths of sail.
SAILING properly denotes the art of navigating and working a ship, or of causing her to observe such motions and directions as are aligned by the navigator; in which sense, failing differs from navigation, and must be learned by practice on shipboard. See Navigation.

SAINT, in the Roman church, a holy person deceased, and since his decease canonized by the pope, after several informations and ceremonies. See Canonization.

SAINT FOIN, in botany. See Hedysarum, and Agriculture. p. 65.

SALEP, in the materia medica, the root of a species of orchis. See Orchis.

Salep should be chosen clean, firm and hard; it is very little liable either to decay or sophistication. The salep differs very little from the common orchis in virtue. Its appearance is owing to the manner of preparing it, and consequently this may be done from the roots of orchis of our own growth. To prepare the salep imitate in preparation of salep, Mr. Geoffroy chose the largest, fairest, and plumpest roots he could find; these he nicely skinned; then throwing them into cold water, he suffered them to macerate there for some time: after this he lightly boiled them, and then taking them out of the water and draining them, he had them strung upon threads to be dried in a warm dry air; when the roots were thoroughly dried, they were very transparent, and resembled pieces of tragacanth, and continued dry and hard. The roots thus prepared may be reduced to powder, which will dissolve in boiling water; and a scruple of it will make a balsam full of jelly, in the manner of the Turkish salep. This jelly is an admirable medicine in all cases in which a balsam is required: it is an excellent medicine in fevers, whooping cough, and other cases of consumption.

SALEM, a port-town of New England, a little north of Boston.

SALE P, in the materia medica, the root of a species of orchis. See Orchis.

SALISBURY, the capital city of Wiltshire, situated eighty miles west of London, and thirty-five miles south-east of Bristol. It sends two members to parliament.

SALIVA, spittle, a thin pellucid humour, separated from the arterial blood, by the glands about the mouth and fauces, and conveyed, by proper salivary ducts, into the mouth, for several uses. See Anatomy, p. 307.

SALIVAL, an epithet applied to the glands and ducts which supply and secrete the saliva. See Anatomy, p. 307.

SALIVATION, in medicine, a promoting of the flux of saliva, by means of medicines, mostly by mercury. The chief use of salivation is in diseases belonging to the glands and the membranes adipose, and principally in the cure of the venereal disease, though it is sometimes also used in epidemic diseases, cutaneous diseases, &c. whose crises tend that way. See Medicine.

SALIX, in botany, a genus of the dioecia diandria class. There are thirty species.

Salep should be chosen clean, firm and hard; it is very little liable either to decay or sophistication. The salep differs very little from the common orchis in virtue. Its appearance is owing to the manner of preparing it, and consequently this may be done from the roots of orchis of our own growth. To prepare the salep imitate in preparation of salep, Mr. Geoffroy chose the largest, fairest, and plumpest roots he could find; these he nicely skinned; then throwing them into cold water, he suffered them to macerate there for some time: after this he lightly boiled them, and then taking them out of the water and draining them, he had them strung upon threads to be dried in a warm dry air; when the roots were thoroughly dried, they were very transparent, and resembled pieces of tragacanth, and continued dry and hard. The roots thus prepared may be reduced to powder, which will dissolve in boiling water; and a scruple of it will make a balsam full of jelly, in the manner of the Turkish salep. This jelly is an admirable medicine in all cases in which a balsam is required: it is an excellent medicine in fevers, whooping cough, and other cases of consumption.

SALOON,
SAMARICAND, a city of Uzbek Tartary, formerly its capital: E. long. 66°, N. lat. 40°.

SAMARIA, an ancient city of Palestine, in Asiatic Turkey, forty-five miles north of Jerusalem.

SAMPSEANS, in church history, an ancient sect, who were properly neither Jews, Chriftians, nor Gentiles, though they took their names from the Hebrew word fe-mer, fun; as though they worshipped that planet. They acknowledged only one God; washed themselves often; and in almost every thing attached themselves to the religion of the Jews.

Books of SAMUEL, two canonical books of the Old Testament, so called as being usually ascribed to the prophet Samuel. The books of Samuel, and the books of Kings, are a continued history of the reigns of the Kings of Israel and Judah; for which reason the books of Samuel are like-
wife styled the first and second books of Kings. Since the first twenty-four chapters contain all that relates to the history of Samuel, and the latter part of the first book, and all the second, include the relation of events that happened after the death of that prophet, it has been supposed that Samuel was author only of the first twenty-four chapters, and that the prophets Gad and Nathan finished the work. The first book of Samuel comprehends the transactions under the government of Eli, and Samuel; and under Saul, the first king; and also the acts of David, whilst he lived under Saul, and is supposed to include the space of a hundred and one years. The second book contains the history of about forty years, and is wholly spent in relating the transactions of king David's reign.

SAMYDA, in botany, a genus of the decandria monogyne class. The calix consists of five coloured leaves; it has no corolla; and the berry has three valves, and one cell. There are five species, none of them natives of Britain.

SANCTIFICATION, the act of sanctifying, or rendering a thing holy.

The reformed divines define sanctification to be an act of God's grace, by which a person's desires and affections are alienated from the world, and by which he is made to die to sin, and to live to righteousness; or, in other words; to feel an abhorrence of all vice, and a love of virtue and religion.

SANCTION, the authority given to a judicial act, by which it becomes legal and authentic.

SANCTUARY, among the Jews, also called Sanctum sanctorum or Holy of holies, was the holiest and most retired part of the temple of Jerusalem, in which the ark of the covenant was preserved, and into which none but the high priest was allowed to enter, and that only once a year, to intercede for the people. Some distinguished the sanctuary from the sanctum sanctorum, and maintain that the whole temple was called the sanctuary.

To try and examine any thing by the weight of the sanctuary, is to examine it by a just and equal scale: because, among the Jews, it was the custom of the priests to keep stone weights, to serve as standards for regulating all weights by, though these were not at all different from the royal, or profane weights.

Sanctuary, in the Roman church, is also used for that part of the church in which the altar is placed, encompassed with a rail or balustrade.

SANCTUARY, in our ancient customs, is the same with asylum. See Asylum.

SAND, in natural history, a genus of fossils, the characters of which are, that they are found in minute concretions; forming together a kind of powder, the genuine particles of which are all of a tendency to one determinate shape, and appear regular, though more or less compleat concretions; not to be dissolved or disunited by water, or formed into a coherent mass by means of it, but retaining their figure in it; transparent, vitrifiable by extreme heat, and not dissoluble in, nor effervescing with, acids. Sands are subject to be variously blended both with homogene and heterogene substances, as that of talcs, &c. and hence, as well as from their various colours, are subdivided into a number of species.

SAND-BAGS, in the art of war, are bags filled with earth or sand, holding each about a cubic foot; their use is to raise parapets in haste, or to repair what is beaten down.

SANDECK, a town of little Poland, thirty-five miles south of Cracow.

SANDEEL, ammodites, in ichthyology. See Ammodites.

SANDAL, in antiquity, a rich kind of slipper worn on the feet by the Greek and Roman ladies, made of gold, silk, or other precious stuff. It consists of a sole, with an hollow at one extreme to embrace the ankle, but leaving the upper part of the foot bare.

Sandal, is also used for a shoe or slipper worn by the pope, and other Roman prelates, when they officiate. It is also the name of a sort of slipper worn by several congregations of reformed monks. This last consists of no more than a mere leather sole, fastened with latches or buckles, all the rest of the foot being left bare. The capuchins wear sandals; the recollects, clogs: the former are of leather, and the latter of wood.

SANDARACH, in natural history, a very beautiful native fossil, though too often confounded with the common fictitious red arsenic, and with the red matter formed by melting the common yellow orpiment.

It is a pure substance, of a very even and regular structure, is throughout of that colour which our dyers term an orange-scarlet, and is considerably transparent even in the thickest pieces. But though, with respect to colour, it has the advantage of cinnamon while in the mafs, it is vastly inferior to it when both are reduced to powders. It, is moderately hard, and remarkably heavy, and, when exposed to a moderate heat, melts and flows like oil: if set on fire, it burns very briskly.

It is found in Saxony and Bohemia, in the copper and silver mines; and is sold to the painters, who find it a very fine and valuable red: but its virtues or qualities in medicine, are no more ascertained at this time, than those of the yellow orpiment.

Gum-Sandarach, is a dry and hard resin, usually met with in loose granules, of the bigness of a pea, a horse-bean, or larger; of a pale whitish yellow, transparent, and of a rufinous smell, brittle, very inflammable, of an acid and aromatic taste, and diffusing a very pleasant smell when burning. It is produced from a species of the juniper.

It flows only from these trees in hot countries; but the natives promote its discharge by making incisions in the bark.

Sandarach is good in diarrhoeas, and in haemorrhages.

The varnish makers make a kind of varnish of it by dissolving it in oil of turpentine or linseed; or in spirit of wine.

Sandiver, a whitish salt, continually cast up from the metal, as it is called, whereof glass is made; and, swimming on its surface, is skimmed of.

Sandiver is also plentifully thrown out in the eruptions of volcanos; some is of a fine white, and others tinged bluish or yellowish.

Sandiver is a detergent, and good for foulnesses of the skin. It is also used by gilders of iron.

Sandix, a kind of mineral, or red-lead, made of ceruse, but much inferior to the true minium.

Sandwich, one of the five ports, in Kent, ten miles east of Canterbury: it sends two members to parliament, and gives the title of Earl to the noble family of Montague.
SANGUINATION, in the animal economy, the conversion of chyle into true blood. See CHYLE.

SANGUNARIA, blood-wort, in botany, a genus of the polyandria monogyna class. The corolla consists of eight petals, and the calyx of two leaves; the pod is oval, with one cell. There is but one species, a native of America.

SANGUNE, in general, something abounding with, or resembling blood. See Blood.

SANGUIS, See Blood.

SANGUISORBA, in botany, a genus of the tetrandria monogyna class. The corolla consists of one petal; the stigma lies upon the tube; the stigmas are simple; and the fruit is a berry. There is but one species, a native of India. The wood is reckoned to be attenuant and cordial.

SANGUIFICATION, in the animal economy, the conversion of chyle into true blood. See CHYLE.

SANHEDRIM, among the Jews, the great council of the nation, consisting of seventy senators, taken partly from among the priests and levites, and partly out of the inferior judges, who formed what was called the lesser sanhedrim. They had the right of judging in capital cases, and sentence of death might not be pronounced in any other place; for which reason the Jews were forced to quit this hall, when the power of life and death was taken out of their hands, forty years before the destruction of the temple, and three years before the death of Christ.

SANEDRIM, among the Jews, the great council of the nation, consisting of seventy senators, taken partly from among the priests and levites, and partly out of the inferior judges, who formed what was called the lesser sanhedrim. The room they met in was a rotunda, half of the room they met in was a rotunda, half of the temple, and three years before the death of Christ.

The authority of this council was very extensive: for they decided such causes as were brought before them by way of appeal from the inferior courts; and the king, the high-priests, and prophets, were under the jurisdiction of this tribunal. They had the right of judging in capital cases, and sentence of death might not be pronounced in any other place; for which reason the Jews were forced to quit this hall, when the power of life and death was taken out of their hands, forty years before the destruction of the temple, and three years before the death of Christ.

There were several inferior sanhedrims in Palestine, each of which consisted of twenty-three persons; all these depended on the great sanhedrim of Jerusalem.

SANTALUS, in botany, a genus of the decandriamonoamyla class. The umbellae are thick; the fruit is rough; and the stigma is semitectate. There are eight species, none of them natives of Britain.

SANTOLINA, a genus of the syngenesia polygamy equalis class. The receptacle is paleaceous; the pappus is very short; and the calyx is hemispherical and imbricated. The species are four, none of them natives of Britain.

SAP, a juice furnished by the earth, and changed into the sap of plants. See Anatomy, p. 243.

SAPIENZA, an island and cape in the Mediterranean Sea, on the south-west point of the Morea, E. long. 21° 14', N. lat. 26° 45'.

SAPPHIC, in poetry, a kind of verse much used by the Greeks and Latins, denominated from the inventreis Sappho. The Sapphic verse consists of five feet, whereof the first, fourth, and fifth are trochees, the second a sponde, and the third a dactyl.

SAPINDUS, in botany, a genus of the ocdandria digynia class. The calyx consists of four leaves; and the corolla of four petals; and there are three round, connate, ventricose capsules. The species are three, none of them natives of Britain.

SAPPHIRE, a pellucid gem, which, in its finest state, is of a deep blue; in the finest specimens it is of the deepest azure, and in others varies into paleness in shades of all degrees, between that and a pure crystal brightness; without the least tinge of colour, but with a lustre much superior to the crystal. They are distinguished into four sorts, viz. the blue sapphire, the white sapphire, the water sapphire, and the milk sapphire. The gem known to us by this name is extremely different from the sapphire of the ancients, which was only a semi-opaque stone, of a deep blue, veined with white, and spotted with small gold-coloured spangles, in the form of stars, and was only a more beautiful kind of the lapis lazuli: but our sapphire they have described under the name of beryllus aeroides, or the sky-blue beryl.
kingdom of Pegu in the East Indies, where some are found perfectly colourless, and others of all the shades of blue; these are all found in the pebble-form. We have very fine faphires also, partly pebble, partly crystal-shaped, from Bifnagar, Conoor, Calicut, and the island of Ceylon; these also are of all the shades of blue. And in Ceylon there are sometimes found a sort of baffard gems, of a mixed nature between the fapphire and ruby. The ocidentals are from Silefia, Bohemia, and many other parts of Europe; but though these are often very beautiful stones, they are greatly inferior, both in lulishe and hardness, to the oriental.

SAPPHIRINE WATER, in the materia medica, also called blue eye-water, is thus prepared: Pour a pint of lime-water, made strong and fresh, into a copper-veffel, add to it a dram of crude saI ammoniac, and throw in some filings or small pieces of copper, and let it stand till it has acquired a beautiful colour.

This is used as an eye-water; also to do to tere old ulcers; and sometimes it is mixed with other things in injections in gonorrhoeas.

SARABANDES, a sort of monks among the ancient Christians, who did not reftort to the wildernefs as others did, but lived publicly in cities. Two or three of them usually dwelt together, but they had no rule or government; they however observed very strict rules; wore loose sleeves, wide focking, coarse clothes, frequently sighed, and always bitterly inveighed against the clergy.

SARABAND, a musical composition in triple time, the motion of which are slow and serious.

SARACENS, the inhabitants of Arabia; so called from Sarab, which signifies a desert, as the greatest part of Arabia is; and this being the country of Mahomet, his disciples were called Saracens.

SARAGOSA, the capital of the province of Aragon in Spain: W. long 1° 15'; and N. lat. 41° 32'.

SARCASM, in rhetoric, a keen bitter expression which has the true point of satire, by which the orator scoffs and insults his enemy: such was that of the Jews to our Saviour. "He favored others, himself he cannot save." J. W. "

SARCOCELE, in surgery, a spurious rupture, or hernia, wherein the nettle is considerably tumid or indurated, like a festiitis, or much enlarged by a feathery excrecence, which is frequently attended with acute pains and sometimes ulceration, so as to degenerate at last into a cancerous disformation. See SURGERY.

SARCOCOLLA, in pharmacy, a gum-refin, which approaches greatly to the nature of the simple gums. It is brought to us from Peria and Arabia, in small granules moderately heavy, and of a whitish-brownish, or reddish colour, very friable, of a faintish disagreeable smell, and of an acrid and nauseous taste. Hoffman absolutely condemns the internal use of it. However, it is recommended in ophthalmias, and defcriptions of a sharp matter upon the eyes; and is generally ordered to be dissolved in milk for this purpose.

SARCOLOGY is that part of anatomy which treats of the soft parts, viz. the moles, interlines, arteries, veins, nerves, and fat. See ANATOMY.

SARCOMA, in surgery, denotes any feathery excrecence.

SARCOPHAGOUS medicines, in surgery, &c. are those which at away bad flesh, and otherwise called caustics. See CAUSTICS.

SARCOMA, in surgery, medicines which generate flesh in wounds.

SARDINIA, an island of the Mediterranean, situated between 3° and 10° E. long. and between 39° and 41° N. lat. It is about one hundred and forty miles long, and sixty broad; and gives the title of king to the duke of Savoy, under whose dominion it is.

SARDIS, the ancient capital of Lydia, in Asia, now in ruins.

SARDONYX, in natural history, a genus of semi-pellucid gems, of the onyx structure, zoned or tabulated, and composed of the matter of the onyx variegated with that of the red or yellow carnelian. See CARNELIAN and ONYX.

SARGUS, in ichthyology. See SPARUS.

SARK, a little island between Guernsey and Jersey, subject to Great Britain.

SAROTHRA, in botany, a genus of the pentandria tri-gynia class. The calix consists of five segments, and the corolla of five petals; the capsule is coloured, and has three cells and one valve. There is but one species, a native of Virginia.

SARSAPARRILLA, in botany. See SMILAX.

SATORIUS, in anatomy. See ANATOMY, p. 207.

SARUM, or Old Sarum, a dorough-town of Wiltshire, situated a little north of Salisbury. It lends two members to parliament.

SASSAFRAS, in botany. See LAURUS.

SATURDAY, the seventh or last day of the week so called from the idol Satir, worshipped on this day by the ancient Saxons, and thought to be the same as he Saturn of the Latins.

SATIN, a glossy kind of silk stuff, the warp of which is very fine, and stands out so as to cover the coarser woof.

SATINET, a slight thin kind of fattin, commonly striped, and chiefly used by the ladies for summer night-gowns.

SATURANTS, in pharmacy. See ABSORBENTS.

SATURATION, in chemistry, is the impregnating an acid with an alkali, or vice versâ, till either will receive no more, and the mixture will become neutral.

SATURDAY, the seventh or last day of the week, so called from the idol Satir, worshipped on this day by the ancient Saxons, and thought to be the same as the Saturn of the Latins.

SATUREIA in botany, a genus of the didynamia gymnoperma class. The lacinæ of the corolla are nearly equal; and the flamina are approximate. The species are nine, none of them natives of Britain.

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The leaves of summer favory are very pungent, warm, and aromatic; and afford, in distillation with water, a subtile effential oil. Both are esteemed good in crudities of the stomach, asthma, and menstrual obstructions.

SATURN, in astronomy. See ASTRONOMY, p. 442.
SAUNDER S. See SANTALUM.
SAX, VOLAXIA, a subdivision of Finland, in Ruflia, situated between Cajania, Boxholm, Farala, and Bothnia.
SAVOUR, in botany. See SAVOR.
SAVOUR. See Taste.
SAVOY, a duchy, situated between France and Italy, on the well side of the Alps; bounded by the lake and territory of Geneva, on the north; by Switzerland and Piedmont, on the east; by another part of Piedmont and Dauphine, on the south; and by Franche Comte and Dauphine, on the west.
SAVAGESIA, in botany, a genus of the protandria monogynia class. The calix consists of five leaves and the corolla of five limbed petals; the stamen has five leaves, lying alternately between the petals; and the capsule has one cell. There is but one species, a native of Jamaica.
SAW, an instrument which serves to cut into pieces several fold matters, as wood, flone, ivory &c.
The belt saws are of tempered steel ground bright and smooth; those of iron are only hammer hardened; hence the rift, besides their being stiffer, is likewise found smoother than the last. They are known to be well hammered by the thin bending of the blade; and to be well and evenly ground, by their bending equally in a bow.
SAW-FISH. See SQUALUS.
SAXIFRAGA, in botany, a genus of the decandria digynia class. The calyx consists of five segments, and the corolla of five petals; the capsule has a double beak and one cell. The species are 38 nine of them natives of Britain.
The tuberous roots at the foot of the granulata or white-flowered saxifrage are kept in the shops, under the name of saxifrage seeds; they are diuretic and attenuant; and therefore good in nephritic cataracts and obstructions of the monads and vesica.
SAXONY, the name of two circles of the German empire, distinguished by the epithets Upper and Lower. The circle of Upper Saxony comprehends the duchy of Saxony, the marquises of Mecklenburg, and Brandenburg, and the duchies of Pomerania, Sax Mecklenburg, Sax Merseburg, and Sax Naumburg. The circle of Lower Saxony comprehends the duchies of Mecklenburg, Holstein, Lauenburg, Luneburg, Zell, Bremen, Brunfwic, Hanover, and Magdeburg; the principalities of Verden and Halberstadt, and the bishopric of Hildesheim.
SAY, or SAYS, in commerce, a kind of serge or woollen stuff, much used abroad for linings, and by the religious for shirts; with us it is used for aprons by several forts of artificers, being usually dyed green.
SCABIOSA, in botany, a plant of the tetrandria monogyonia class. The common calyx consists of many leaves, and the proper one is double; the receptacle is paleaceous. The species are 25; three of them natives of Britain, viz. the sucuola, or devil's bit; the arvensis, or common field scabious; and the columbaria, or leffer field scabious.
SCAFFOLD, among builders, an assemblage of planks and boards, fastened by tassels and pieces of wood fixed in the wall; whereon masons, brick layers, &c. stand to work in building high walls, &c. and plasterers in plastering ceilings, &c. [Scaffold]
SCAF, in poetry, the measuring of a verse by feet, in order to see whether or no the quantities be duly observed. The term is chiefly used in regard to the Greek and Latin verses. Thus an hexameter verse is scanned, by resolving it into six feet; a pentameter, by resolving it into five feet, &c.

SCAPE-GOAT, in Jewish antiquity, the goat which was set at liberty on the great day of expiation.

Spencer is of opinion, that the scape-goat was called Azazel, because it was sent to Azazel, i.e. the devil; the reasons of which ceremony, he takes to be these: 1. That the goat, loaded with the sins of the people, and sent to Azazel, might denote the miserable condition of the sinners. 2. The goat was thus loaded to the demons, to show that they were impure, and to deter the people from worshipping them. 3. That the goat sent to Azazel sufficiently expiating the sins of the Israelites, they might The more willingly abate from the expiatory sacrifices of the heathens.

SCARABÆUS, or BEE, in zoology, a genus of insects, of the coleoptera-order: the antennae of the beetles are of a clavated figure, but little vermilion produces a good scarlet; but if a flower in a print is to be painted of a scarlet colour, the lights as well as the shades should be covered with minium, and the shaded parts finished with carmine, which will produce an admirable scarlet.

SCARIFICATION, in surgery, the operation of making several incisions in the skin by means of lancets, or other instruments, particularly the cupping instrument. See Surgery.

SCARLET, a beautiful bright red colour.

In painting in water-colours, minium mixed with a little vermilion produces a good scarlet; but if a flower in a print is to be painted of a scarlet-colour, the lights as well as the shades should be covered with minium, and the shaded parts finished with carmine, which will produce an admirable scarlet.

SCARP, in fortification, is the interior talus, or slope of the ditch next the place, at the foot of the rampart.

SCARP, in heraldry, the scarf which military commanders wear for ornament.
SCEPTICISM, the doctrines and opinions of the sceptics, whose distinguishing tenet was, that all things are uncertain and incomprehensible, and that the mind is never to assent to any thing, but to remain in perpetual doubt and suspense. This doctrine was also called pyrrhonism, from the name of its author, See Pyrrhonians.

SCHAFFHOUSE, the capital of the canton of Schaffhouse, one of the most northern cantons of Switzerland: E. long. 8° 40', N. lat. 47° 42'.

SCHALHOLT, the capital of Iceland, subject to Denmark: W. long. 19°, N. lat. 64° 30'.

SCHAMACHIA, a city of Persia, in the province of Chirvan, situated on the west side of the Caspian sea, in E. long. 50°, N. lat. 41°.

SCHELD, a river which rises in the confines of Picardy, and runs north-east by Cambrai, Valenciennes, Tourney, Oudenarde, &c. and receiving the Lys at Ghent, runs east by Dendermond, and then north to Antwerp; below which city it divides into two branches; one called the Water-Scheld, which separates Flanders from Zealand, and discharges itself into the sea near Flushing; and the other called the Oster-Scheld, which runs by Bergen-op-Zoom, and afterwards between the islands Beveland and Schouwen, and a little below falls into the sea.

SCELLING, an island of Holland, at the entrance of the Zuyder sea, between Flie Island and Amseland: E. long. 5° 20', N. lat. 53° 34'.

SCHEMNITZ, capital of the mine towns in Upper Hungary, sixty miles north-east of Preiburg.

SCHENECTIDA, a fortress of New-York, in America, situated on Hudson's River, in the province of Albany, a hundred miles north of New York city.

SCHELTLAND, about forty islands, which constitute part of the country of Orkney, and the Orkades, in Scotland, valuable on account of the herring-fishery on their shores: situated between 1° east and 2° west longitude, and between 61° and 62° of north latitude.

SCHIRAS, or Sheras, a city of Persia, in the province of Fars, 180 miles south of Isphahan; reckoned the second city in that kingdom.

SCHISM, a separation, or breaking off from communion with any church; on account of some disagreement in matters of faith or discipline.

SCHOENUS, in botany, a genus of the triandria monogynia class. The glumes are paleaceous, and have but one valve; it has no corolla, and but one round seed. The species are 13, five of them natives of Britain.

SCHOLASTIC, something belonging to the schools, See School.

SCHOLIAST, a grammarian, who writes scholia, that is, notes, glosses, &c. upon ancient authors, who have written in the learned languages. See the next article.

SCHOLIUM, a note, annotation, or remark, occasionally made on some passage, proposition, or the like. This term is much used in geometry, and other parts of mathematics, where, after demonstrating a proposition, it is customary to point out how it might be done some other way, or to give some advice, or precaution, in order to prevent mistakes, or add some particular use, or application thereof.

SCHOOL, a public place, wherein the languages, or arts and sciences are taught. Thus we say, grammar-school, writing-school, &c.

SCHWALBACH, a town of Germany, in the circle of the Upper Rhine, and in the territory of the Wetterau, and county of Nassau, eight miles north of Mentz.

SCHWALBEA, in botany, a genus of the didynamia angiospermia class. The calix consists of four segments,
SCI, (570) SCO

SCIRPUS, in botany, a genus of the triandria monogynia class. The calix is imbricated and pappuse; and it has no corolla, and but one beardless seed. The species are 27, ten of which are natives of Britain.

SCIRRUS, in surgery and medicine, a hard tumour of any part of the body, void of pain, arising from the inflammation and induration of the fluids contained in a gland; though it may appear in any other part, especially in the fat, being one of the ways wherein an inflammation terminates. See Medicine and Surgery.

SCIURUS, the Squirrel, a genus of quadrupeds belonging to the order of Gliridae. It was two feet in each jaw, the superior ones shaped like wedges, and the inferior ones compressed. There are eleven species.

- The vulgaris, or common squirrel, which is a native of most southern parts of Europe, has a pencil of hairs on the top of the ears, four toes on the fore-feet, and live on the hind ones: In the summer, it is of a reddish colour, with a white belly; in the winter, it is of a blueish ash-colour. The squirrel is a very active animal; it feeds upon nuts, berries, &c. which it carries to its mouth by the fore-feet: It lays up its superfluous food in holes; and makes a round nest of moss.

SCLAREA, in botany. See Salvia.

SCLAVONIA, a province subject to the house of Austria, and bounded on the north-east by the rivers Drave and Danube, which separate it from Hungary; being about two hundred miles long, and fifty broad.

It takes its name from the Slav, an ancient people of European Scythia; who, from whom is the Slavonic language, which is said to be the most extensive language in the world, except the Arabic; as being the common mother of the Rusian, Hungarian, Polish, Bulgarian, Carinthian, Bohemian, &c. languages.

SCLERANTHUS, in botany, a genus of the decandria monogynia class. The corolla consists of six open, deciduous petals; and the filaments resemble threads. There are eight species, two of them natives of Britain, viz. the bifolia, or vernal star-hyacinth; and the autumnalis, or lesser autumnal star-hyacinth.

The middle part of the root of the scilla maritima, a native of Spain, is only used in medicine: the apothecaries cut the root perpendicularly in two; and separating the heart and the outer parts, they expose the others to dry. This root is extremely acid, attenuant, and diffolvent: it is apt to prove emetic in whatever form it is given; but this may be prevented, by adding a few grains of cinnamon to it: it then becomes a powerful medicine in all obstructions of the visera; it promotes urine and the menses, and cuts the tough phlegm which almost chokes in asthmatic and many other disorders of the breast.

SCLEROPSIA, in botany, a genus of the lygnesia polygamy equalis class. The receptacle is pellucid; the calix is imbricated and pappose; and it has no pappus. There are two species, both natives of Italy.

SCLEROTICAS, medicines proper to harden and constrict any part of the body, void of pain, arising from the inflammation and induration of the fluids contained in a gland; though it may appear in any other part, especially in the fat, being one of the ways wherein an inflammation terminates. See Medicine and Surgery.

SCLEROTICA, in anatomy. See Anatomy, p. 289.

SCLEROTICS, medicines proper to harden and constrict the flesh of the parts to which they are applied: as pursuing, house-leek, fleawort, garden night-hade, &c.

SCLEROPAX, in ornithology, a genus belonging to the order of grallae. The beak is cylindrical, obtuse, and longer than the head; the nostrils are linear; the face is covered; and the feet have four toes. There are 18 species.

SCLEROPENDRA, in zoology, a genus of insects belonging to the order of aptera. The feet are very numerous, being as many on each side as there are joints in the body; the antennae are fuscacese; there are two jointed pappi; and the body is depressed. There are eleven species.

SCLYMYUS, in botany, a genus of the lygnesia polygamy equalis class. The receptacle is pellucid; the calix is imbricated and pappose; and it has no pappus. There are two species, both natives of Italy.

SCOMBER, in ichthyology a genus belonging to the order of thoracii. The head is smooth and compressed; and there are seven rays in the gill-membrane. The species are ten.

SOME,
SCORZONERA, in botany, a genus of the fyngegenia polygamia class. The calix consists of four segments; the corolla is rotated, with four segments; and the capsule has one cell, and two valves, containing many seeds. There are two species, none of them natives of Britain.

SCOPARIA, in botany, a genus of the tetrandria monogynia class. The receptacle is naked; the calix consists of four segments; the corolla is fomewhat globular; and the capsule分离s from the water in boiling; this substance they call scratch; and these pans, being placed at the corners of the salt-pan, where the heat is least violent, catch it as it fubfides there.

SCOPARIA, in botany, a genus of the diadelphia de-
SCULPTURE, an art by which, in taking away, or adding to matter, all sorts of figures are formed by the hand, either in the stone, wood, wax, or metal. In its full extent, it signifies both the art of working in cretnx, properly called carving; and of working in relief, which is more strictly called sculpture.

The first works in sculpture were with clay, not only in making statues, but in forming models; and to this day a sculptor never undertakes anything considerable, without forming a model, either in clay or wax. In making figures of these materials, they begin and finish their work with their hands, using only three or four pieces of wood, which are roundish at one end, and at the other flat, with a sort of claws and teeth, which are to smooth and scratch the work. For waxy models, they use every pound of wax add half a pound colophony to them, and melt it together with oil of olives; more or less of the latter being used as they would have the matter harder or softer: some also add turpentine, and melt it together with oil of olives; but it must be such, however, as is firm and close: for smaller works and ornaments, the softer wood is used; but it must be fuch, however, as is firm and close: for a large work, though it be only a single figure, it is better to make use of several pieces of wood, or bits of board, glued together, than of one whole piece, which is more liable to crack; for a thick piece of wood may not be dried to the heart, however it may appear on the outside.

In sculpture in marble and other stone, the first thing to be done is to saw out a block of marble, of the bigness of the model, and this being done, the superficialities are to be taken off by a clового tool, called a dog's tooth, it having two points, but one not so sharp as the other. After this he makes use of his graining, which is a flat cutting tool, with three teeth; he then takes off, with a smooth chisel, the graining left on the marble, and uses it with dexterity and delicacy, to give finish and tenderness to his figure; till at length, taking rasps of different degrees of fineness, the work is gradually rendered fit for polishing. To polish the work, the sculptor uses pumice stone and flint; then he goes over it with tripod; and when he would give it more luster, rubs it with leather and straw ashes. There are several other tools used by sculptors, adapted to the different parts of the work, and the nature of the stone they make use of. As the models of clay shrink as they grow dry, whenever sculptors undertake a considerable piece of work, they only use the model for making a mould of plaster or flucco, in which is formed a figure of the same matter, which serves them thenceforth for a model, and by which they adjust all their measurements and proportions. To proceed the more regularly, on the head of the model they place an immovable circle divided into degrees, with a moveable rule or index, fixed in the centre of the circle, and divided also into equal parts; from the end of the rule hangs a line with a plummet, which serves to take all the points, to be transferred thence to the block of marble, from whose top hangs another plummet, like that of the model. But there are some excellent sculptors, who disapprove of this method; urging, that the smallest motion of the model changes their measures, for which reason they chuse rather to take all their measures with the compasses.

SCUM, properly denotes the impurities which a liquor, by boiling, casts up to the surface.

The term sea is also used for what is more properly called the scoria of metals.

SCURVY, in medicine. See Medicines, p. 106.

SCURRENCE, in botany. See Cochlearia.

SCUTELLARIA, in botany, a genus of the didynamia gymnoferma class. The calix is entire on the edge, is that after the flowering, and operculated. The species are 13, two of them natives of Britain, viz. the galeri- culata, or hooded-willow-herb; and the minor, or lesser hooded-willow-herb.

SCUTIFORME OS, in anatomy, the same with rotula.

SCUTIFORMIS CARTILAGO, in anatomy, the same with the thymus cartilage. See Anatomy, p 185.

SCUTITILES, in a ship, square holes cut in the deck, big enough to let in the body of a man, serving to let people down into any room below upon occasion, or from one deck to another.

SCYTHIA. The northern parts of Europe and Asia were anciently so called, which afterwards obtained the name of Tartary.

SEA, is frequently used for that vast tract of water encompassing the whole earth; but is more properly a part or division of these waters, and is better defined a lesser assemblage of water, which lieth before and wasteth the coasts of some particular countries from whence it is generally denominated, as the Irish sea, the Mediterranean sea, the Arabian sea &c.

What proportion the superficialities of the sea bear to that of the land is not precisely known, though it is said to be somewhat more than two thirds. As the waters of the earth must necessarily rise to the surface thereof, as being specifically lighter than the earth, it was necessary there should be large cavities therein for receptacles to contain them; otherwise they would have overflowed all the superficialities of the earth, and left them rendered it utterly uninhabitable for terrestrial animals. For the centre of the earth being the common centre of gravity, and the nature of fluids being such that they equally yield to equal powers, and the power of attraction being everywhere equal at equal distances from the centre, it follows, that the superficial parts of the water will every where conform themselves to an equidistant situation from the centre, and consequently will form the surface of a sphere so far as they extend. Hence, that the sea seems higher than the earth or land, results from the fallacy of vision, whereby all objects, and the parts of land as well as sea, the farther they are off from us, the higher they appear; the reason of all which is plain from optics: for it is well known, that the denser any medium is through which we behold objects, the greater is the refraction, or the more their images appear above the horizontal level, also the greater quantity of the medium the rays pass through, the
the more will they be bent from their first direction: on both these accounts the appearances of things remote, and on the sea, will be somewhat above the horizon, and the more fo as they are the more remote.

With regard to the depth or profundity of the sea, Varan us affirms, that it is in some places innumerable, and in other places very various, being in certain places 20, 40, 60, 80, 100, and 120 English miles, in other places deeper, and much hills in bays than in oceans. In general, the depths of the sea bear a great analogy to the height of mountains on the land, so far as is hitherto discovered.

There are two principal reasons why the sea doth not increase by means of rivers, &c. falling every where into it. The first is, because waters return from the sea by subterranean cavities and aqueducts, through various parts of the earth. Secondly, because the quantity of vapours rais'd from the sea, and falling on the land, only cause a circulation, but no increas of water. It hath been found by calculation, that in a summer's day there may be rais'd in vapours, from the Mediterranean sea, 26320000000 tons of water; and yet this sea receiveth not, from all its nine great rivers, above 1527000000 tons per day, which is but a third part of what is exhal'd in vapours.

With regard to the saltness of the sea-water, it is very rationallly judged to arise from great multitudes both of mines and mountains of salt, dispersed here and there in the depths of the sea. Dr Halley supposes that it is probable the greatest part of the sea salt, and of all salt lakes, as the Caipian sea, the Dead sea, the lake of Mexico, and the Titicaca in Peru, is deriv'd from the water of the rivers which they receive; and since this sort of lakes has no exit or discharge, but by the exhalation of vapours; and also since these vapours are entirely fresh, or devoid of such particles; it is certain the saltness of the sea and such lakes must, from time to time increas, and therefore the saltness at this time is greater than at any time heretofore. He further adds, that if, by experiments made in different ages, we could find the different quantity of salt which the same quantity of water (taken up in the same place, and in all other the same circumstances) would afford, it would be easy from thence, by rules of proportion, to find the age of the world very nearly, or the time wherein it has been acq'ting its present saltness.

With regard to the use of this salt property of sea-water, it is observed, that the saltness of the sea prevents its waters pure and sweet, which otherwise would corrupt and stink like a filthy lake, and consequently that none of myriads of creature that now live there could then have a being. From thence also the sea-water becomes much heavier, and therefore ships of greater size and quantity may be used thereon. Salt water also doth not freeze so soon as fresh water, whence the seas are more free for navigation. We have lately published a dissertation, by Dr Russel, concerning the medical ufed of sea-water in diseases of the glands, &c. wherein the author promises some observations upon the nature of sea-water, confider'd as impregnated with particles of all the bodies it passes over, such as submarine plants, fish salts, minerals, &c. and saturat'd with their several effluvia, to enrich it, and keep it from putrefaction; hence this fluid is suppos'd to contract a soapiness, and the whole collection, being pervaded by the fulphureous freams passing through it, to constitute what we call sea-water, the confecut'd diffin-

guiding characteristics of which are saltiness, bitterness, nitritility, and unquickness: whence the author concludes, that it may be justly expected to contribute signal to the improvement of phyic. The cases in which our author informs us we are to expect advantage from sea-water, are,

1. In all recent obstructions of the glands of the intestines and mefacenter. 2. All recent obstructions of the pulmonary glands, and those of the vifeera, which frequently produce consumptions. 3. All recent glandular swellings of the neck, or other parts. 4. Recent tumours of the joints, if they are not suppurated, or become scirrhou's, or cancerous, and have not curios bones for their caufe. 5. Recent defeciations upon the glands of the eye-lids. 6. All defeciations of the skin, from an erysipelas, to a lepra. 7. Defcences of the glands of the nose, with their usual companion a thicknes of the lip. 8. Obstructions of the kidneys, where there is no inflammation, and the fiane not large. 9. In recent obstructions of the liver this method will be proper, where it prevents constrictions of the belly, and affilds other mediciines directed in icteric cafes. The fame remedy is laid to be of signal service in the bromchocie; and is likewise recommended for the prevention of thole bilious colics that do frequently affiict our mariners.

To make sea-water fresh is a thing lalong and much wanted, for the advantage of navigation and commerce; a method for doing which has been long ago invented by Mr Hauton, and the secret published in the Philof. Tranfaft. It is performed by precipitating the water with oil of tartar, and then distilling it. But Mr Appleby's process, which was referred by the lords of the admiralty to the college of phyficians, and communicat'd to the royal society, with some experiments therewith, on Feb. 8, 1753, appears to be more successful, and is performed thus: into twenty gallons of sea-water put fix ounces of a fixed alkali prepare with quick lime as strong as lapis infernalis, and fix ounces of bones calcined to a whitenes, and finely pow'ded; with a low fire, draw off, in a common still, fifteen gallons. Mr Appleby conceives that the alkali here employ'd is the bell adapted to prevent the luminous matter in sea-water from rising by heat in distillation.

In the year 1755, a method of procuring any quantity, of fresh water at sea was publish'd by Dr Butler; together with a method also of preferring fresh-water entirely pure, sweet, and wholesome, during the longeft voyage, and in the warmeft climates. The method more expressly recommended by the doctor for making sea-water fresh is to put a measured wine-quart of the strongest soap leys to fifteen gallons of sea-water; which being distill'd, he affires us will generally yield twelve gallons of fresh water. The above quantity of soap leys, we are told, will bear a repetition of the fame quantity of water four or five times.

This method of Dr Butler was tried, by order of the lords of the admiralty, at the fame time with Mr Appleby's: but the latter, being found to be performed with a less quantity of fuel, was prefered.

In order to keep fresh-water sweet, Dr Butler directs to take of fine, clear, white pearl-ashes, a quarter of a pound avoidupoise, and put into one hundred gallons of fresh water; observing this proportion to a greater or less quantity.
quantity, and flop up your cask as usual, till you have oc-
casion to broach it.

For the ebbing and flowing of the sea, see Astronomy, p. 472.

Seamen, such as are referred to serve the king, or other
persons, at sea, who may not depart without license, &c. Seamen fighting, quarrelling, or making any
perturbation, may be punished by the commissioners of the
navy with fine and imprisonment. Registered seamen are ex-
cempted from serving in any parish office, &c. and
are allowed bounty-money besides their pay. By the law
of merchants, the sea-men of a vessel are accountable to
the master or commander, and the master to the owners,
and the owners to the merchants, for damage sustained
either by negligence or otherwise. Where a seaman is
hired for a voyage, and he deserts it before it is ended,
he shall lose his wages; and in case a ship be lost by a
tempest, or in a storm, the seamen lose their wages,
as well as the owners their freight.

Seaford, a port-town of Sussex, situated on the En-
glish channel, seven miles south of Lewes. It sends two
members to parliament.

Seal, a puncheon, or piece of metal, or other matter,
usually either round or oval, wherein are engraved the
arms, device, &c. of some prince, state, community,
magistrate or private person, often with a legend or sub-
scription, the impression whereof in wax serves to make
acts, instruments, &c. authentic.

Seal is also used for the wax or lead, and the impression
thereon, affixed to the thing sealed.

Seal, in Scots law. See Law, Tit. xii. ey.

Sealer, an officer in chancery appointed by the lord
chancellor or keeper of the great seal to seal the writs
and instrument there made in his presence.

Sealing, in architecture, the fixing a piece of wood or
iron in a wall with plaster, mortar, cement, lead, and
other solid binding. For flapples, hinges and joints, pla-
ster is very proper.

Sealing-wax. See Wax.

Seam or Seme of corn, is a measure of eight bushels.

Seam of glass, the quantity of 120 pound, or 24 tones, each
five pounds weight. The seam of wood is an horse-load.

Sear cloth, or cere-cloth, in surgery, a form of
external remedy somewhat harder than an unguent, yet
fotyer than an emplater, though it is frequently used both
for the one and the other. The fear-cloth is always sup-
poused to have wax in its composition, which distinguishes
and even denominates it. In effect, when a liniment or
unguent has wax enough in it, it does not differ from a
fear-cloth.

Seasin, in a ship, the name of a rope by which the boat
rides by the ship's side when in harbour, &c.

Seasons, in cosmography, certain portions or quarters
of the year, distinguished by the signs which the earth
then enters, or by the meridian altitudes of the sun, con-
sequent on which are different temperatures of the air,
different works in tillage, &c. The year is divided into
four feasons; spring, summer, autumn, and winter. See
Astronomy, p. 546.

St. Sebastian, a port-town of Spain, in the province of
Bicay, and territory of Guipuscoa: situated in W. long.
t° 50', N. lat. 43° 35'.

Secale, Rye, in botany, a genus of the triandria digy-
nia class. The involucrum consists of two leaves, and
contains two flowers. There are four species, only one
of them, viz. the villosum, or wood rye-grass, a native
of Britain. For the cerealia, or common rye cultivated
in our fields, see Agriculture, p. 61.

Secant, in geometry, is a line that cuts another, or di-
vides it into two parts.

Seceder, a sect of Presbyterians, who differed from
the established church of Scotland in the year 1733.
The following circumstance gave rise to this sect. Meff. Erskine,
Wilfon, Moncrieff, and Fisher, ministers of the church
of Scotland, obstinately refused, for several years, to
obey the decisions of the General Assembly with regard to
the settlement of ministers agreeably to the law of patron-
age: For this open contempt of authority, the Assem-
ibly, after many and repeated admonitions, were at last
obliged to eject them from their respective charges. These
four clergymen, when they saw matters carried this
length, immediately complained of persecution; professed
uncommon sanctity and austerity of manners; and cried
out that the church was over-run with various errors,
such as, a compliance with the law of patronage: the
tenderness of the assembly to Professors Simson and Camp-
bell, who were accused of Arian and Arminian heresies;
and a multitude of practical deviations from the cove-
nanted reformation of Scotland: They even inveighed
against the conduct of the government for their ready ad-
mittance of malignant and wicked men into places of truf-
the army and state; for the useless and unlimited restora-
tion of Charles II. to the throne; for the restoration
of prelacy in England, which had been solemnly abjured;
for restoring the superflitious Christmas vespers; for
the repeal of the penal laws against witches, &c. &c. These
things, joined to the popular talents of some of the a-
bove ministers, alarmed the minds of many well-meaning
people, and in a few years procured a numerous train of
followers. Elated with this unexpected success, they
soon split into two parties. The chief point of contest
among the leaders of this sect was concerning the lawful-
ness of what is called the burgess-oath; and hence the
one party have ever since been called Burghers, and the
other Antiburghers. This division naturally weakened
their caufe, and diminished their number, which still
seems to be upon the decline.

Secomiae, in natural history, the name of a genus of
fofis, of the class of the septaria, the characters of
which are; that they are bodies of a dusky hue, divided
by lepta, or partitions of a parry matter, into fewer
or less regular portions, of a moderately firm tex-
ture, not giving fire with steel, but fermenting with acid
menitra, and easily calcining.

The septaria of this genus are, of all others, the most
common, and are what have been known by the little ex-
preffive, or mistaken names of the waxen vein, or Indus
helmontii. We have many species of these bodies com-
mon among us. Of the whitest or browniest kinds we
have thirteen; of the yellowish five; and of the ferrugi-
ous ones, four.

Second, in music, one of the musical intervals; being

Second, in geometry, chronology, &c. the sixieth part
of a prime or minute, whether of a degree, or of an hour.

Second, in music, one of the musical intervals; being

SECONDARY, in general, something that acts as second, or in subordination to another.

SECRETARY, an officer who by his master's orders writes letters, dispatches, and other instruments, which he renders authentic by his signet. Of these there are several kinds: as, 1. Secretaries of state, who are officers that have under their management and direction the most important affairs of the kingdom, and are obliged constantly to attend on the king; they receive and dispatch whatever comes to their hands, either from the crown, the church, the army, private grants, pardons, dispensations, &c. as likewise petitions to the sovereign; which when read, are returned to them; all which they dispatch according to the king's direction. They have authority to commit persons for treason, and other offences against the state, as conservators of the peace at common law, or as justices of the peace throughout the kingdom. They are members of the privy-council, which is seldom or never held without one of them being present: and as to the business corresponding in all parts of this kingdom, it is managed by either of the secretaries without any distinction: but with respect to foreign affairs the business is divided into two provinces, or departments, the southern and the northern, comprehending all the kingdoms and states that have any intercourse with Great Britain; each secretary receiving all letters and addresses from, and making all dispatches to, the several princes and states comprehended in his province. Ireland and the plantations are under the direction of the elder secretary, who has the southern province, which also comprehends France, Italy, Switzerland, Spain, Portugal, and Turkey: the northern province includes the Low Countries, Germany, Denmark, Sweden, Poland, and Muscovy. Each of the secretaries has an apartment in all the royal houses, both for their own accommodation and their officers; they have also a table at the king's charge, or else board-wages. The two secretaries of state have each two under secretaries, and one chief clerk, with an uncertain number of other clerks and translators, all wholly depending on them. To the secretaries of state belong the custody of that seal properly called the signet, and the direction of two other offices, one called the paper-office, and the other the signet-office. 2. Secretary of an embassy, a person attending an ambassador for writing dispatches relating to the negotiation. There is a great difference between the secretary of an embassy, and the ambassador's secretary; the last being a domestic or menial of the ambassador, and the first a servant or minister of the prince. 3. The secretary of war, an officer of the war-office, who has two chief clerks under him, the last of which is the secretary's messenger. There are also secretaries in most of the other offices.

SECTION, in general, denotes a part of a divided thing.

SECRETION, the separation of some fluid from the blood by means of the glands. In the bodies of animals we observe a great number of juices of different natures viz. the blood, lymph, saliva, stomach liquor, intestinal juices, pancreatic juice, bile, urine, &c. and the blood is the general source of all. See Blood, Lymph, Saliva, &c.

SECTOR, in geometry, is a part of a circle comprehended between two radii and the arch; or it is a mixed triangle, formed by two radii and the arch of a circle. Sector is also a mathematical instrument, of great use in finding the proportion between quantities of the same kind, as between lines and lines, surfaces and surfaces, &c. for which reason the French call it the compass of proportion.

The great advantage of the sector above common scale, &c. is, that it is adapted to all radii, and all scales. For, by the line of chords, sines, tangents, &c. on the sector, we have lines of chords, sines, tangents, &c. adapted to any radius between the length and breadth of the sector, when opened.

The sector is founded on the fourth proposition of the sixth book of Euclid, where it is demonstrated, that similar triangles have their homologous sides proportional.

SECULAR, something that is temporal; in which sense the word stands opposed to ecclesiastical: thus we say, secular power, secular jurisdiction, &c.

SECULAR GAMES, ludi seculares, in antiquity, solemn games held among the Romans once in an age. These games lasted three days and as many nights, during which time sacrifices were performed, theatrical shows exhibited, with combats, sports, &c. in the circus. The occasion of these games, according to Valerius Maximus, was to stopt the progress of a plague. The first who had them celebrated at Rome was Valerius Publicola, the first conful created after the expulsion of the kings. The ceremonies to be observed therein were found prescribed in one of the books of the Sibyls. At the time of the celebration of the secular games, heralds were sent throughout all the empire, to intimate that every one might come and see those solemnities which he never yet had seen, nor was ever to see again. Authors are not agreed as to the number of years wherein these games returned, partly because the quantity of the age or seculum among the ancients is not known, and partly on other accounts; some will have it that they were held every hundred years, and that the seculum or age was our century.

SECULARIZATION, the act of converting a regular perfon, place, or benefice, into a secular one.

SECUNDINES, in anatomy, the several coats or membranes wherein the fetus is wrapped up in the mother's womb, as the chorion and amnios, with the placenta, &c. See Midwifery.

SECURIDACA, in botany, a genus of the diadelphia class. The calyx consists of three leaves; the corolla is papilionaceous, with a vexillum; and the pod is oval, and contains one seed. There are two species, both natives of America.

SECUTORES, in antiquity, a kind of gladiators among the Romans, who fought against the retiarii. The secutores were armed with a sword and a buckler, to keep off the net or morsa of their antagonists, and they wore a cape on their head.
SEDAN, a town of Champagne, in France, situated on the river Maas; in E. long. 4° 45', N. lat. 49° 46'.

SEDAN, a city of Upper Hungary, situated on the river Tisza, in E. long. 21° 45', N. lat. 46° 21'.

SEGEDIN, a city of Transylvania, situated E. lon. 24°, N. lat. 47° 25'.

SEGUR, a town of Portugal, in the province of Beira, ten miles north-west of Alcantara. This is also the name of a town in Spain, in the province of Cadiz, and territory of La Mancha, situated among the mountains of Segura; W. long. 2° 50', N. lat. 38° 25'.

SEGURA, a river of Spain, which rising in the north of Cadiz, runs through the province of Segura, and territory of La Mancha, and terminates in the city of Segovia, the largest of the Philippine Islands, situated in E. long. 119°, N. lat. 18° 30'. This is also a name of a city of Spain, in the province of Old Castile, situated W. long. 4° 35', N. lat. 41°.

SEGUES, in the Italian music, is often found before aria, allegro, andante, &c. to show that these portions or parts are to be sung immediately after the last note of that part over which it is written; but if these words a place, or ad libitum, are joined therewith, it signifies that these portions may be sung or not, at pleasure.

SELENDERS, in the manege, are chops, or hairy sores, which are caused by the horse being over-strained in a case of cancer, or from being thrown down from a carriage, or in the act of jumping. These sores are to be taken care of, and if neglected, they will become very offensive. In some cases, they are caused by the horse being thrown down by a fall from a carriage, or in the act of jumping. These sores are to be taken care of, and if neglected, they will become very offensive.

SELENIUM, moonstone, in natural history, a class of plants. The calyx has five segments. The corolla is capillary and there is but one seed. The species are eight, none of them natives of Britain. See Generation, and Agriculture, p. 40.

SELEGAR, a genus of the didynamia angiospermia class of plants. The calyx has five segments; the tube of the corolla is capillary, and there is but one seed. The species are eight, none of them natives of Britain.

SEelic, in botany, a genus of the decandria pentagynia class. The calyx contains five segments, and the corolla of five petals; it has five nectariferous scales at the base of the germen, and five capsules. There are 19 species, nine of them natives of Britain, all orpines and house-leeks.

SEED, in physiology, a substance prepared by nature for the reproduction and conservation of the species both in animals and plants. See Generation, and Agriculture.

SEEDS, in botany, a genus of the didynamia angiospermia class of plants. The calyx has five segments; the tube of the corolla is capillary, and there is but one seed. The species are eight, none of them natives of Britain.

SEEDY, in the brandy trade, a term used by the dealers, to denote a fault that is found in several parcels of French brandy, which renders them unsaleable. The French suppose that these brands are caused by the name by which the brandy is made was pressed. See Seed.

SEEING, the act of perceiving objects by the organ of sight; or it is the sense we have of external objects by means of the eye. See Optics.

SEEING, in the manege. A horse is said to feel when he begins to have white eye browns, that is, when there grows on that part about the breadth of a farthing of white hairs, mixed with those of his natural colour, which is a mark of old age. It is said, that a horse never feels till he is fourteen years old, and always does before he is sixteen years.

SEELED, in the same sense nearly with feeling: when a slip lies down constantly, or steadily on one side, the crane may be seen; and they call it feeling when the rumbles violently and suddenly, by reason of the sea being rough; and they call it feeling when a horse for taking her, as they call it, that is, the weaves leaving her for a time in a bowling sea.
YEAR OF THIS ERA FALLS IN THE YEAR 314 BEFORE CHRIST, BEING TWELVE YEARS AFTER ALEXANDER'S DEATH.

SELLINGENSKOY, A TOWN OF ASIATIC MOSCOVY, IN THE

SELKIRK, A BOROUGH TOWN OF SCOTLAND, IN THE COUNTY OF TWEEDALE, SITUATED 32 MILES SOUTH OF EDINBURGH.

SELENUS, IN BOTANY, A GENUS OF THE PENTANDRIA DIGYNIA CLAS.

SELLATURCICA. SEE ANATOMY, P. 149.

SELZTER WATER, THE NAME OF A MINERAL WATER OF GERMANY, WHICH ARSES NEAR NIDER SEITZ, AND IS NOW USED IN ENGLAND AND MANY OTHER COUNTRIES. WE CALL IT SELTZ, OR SALTZER WATER; AND THE PHYSICIANS PREFER IT IN MANY CASES, AS SWEETISH, EMESIS, AND DIARRHÓE, IN CONTUMPTIONS; IN THE LAST CASE, MIXING IT WITH MILK.

SEMI, A WORD BORROWED FROM THE LATIN, SIGNIFYING HALF.

SEMENDRIA, A TOWN OF EUROPEAN TURKEY, IN THE PROVINCE OF SERVI.

SEMI-CIRCLE, IN GEOMETRY, HALF A CIRCLE, OR THAT FIGURE COMPREHENDED BETWEEN THE DIAMETER OF A CIRCLE AND HALF THE CIRCUMFERENCE.

SEMIELOCCULUS, IN BOTANY, A TERM USED TO EXPRESS THE FLOWERS OF THE SYNGENETIA CLAS.

SEMINARIA, A KIND OF COLLEGE, OR SCHOOL, WHERE YOUTH ARE INSTRUCTED IN THE SCIENCES AND ARTS.

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SEMITIC, A WORD BORROWED FROM THE LATIN, SIGNIFYING HALF.

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SEMIFLORICULUS, IN BOTANY, A TERM USED TO EXPRESS THE FLOWERS OF THE SYNGENETIA CLAS.

SEMPERVIVUM, IN BOTANY, A GENUS OF THE DODECANDRIA CLAS.

SEMINAL, SOMETHING BELONGING TO THE SEMEN OR SEED.

SEMINARY, A KIND OF COLLEGE, OR SCHOOL, WHERE YOUTH ARE INSTRUCTED IN THE SCIENCES AND ARTS.

SEMIS, IN ROMAN ANTIQUITY, THE HALF OF AN AS.

SEMIS, IN ROMAN ANTIQUITY, THE HALF OF AN AS.

SEMISPINALIS, IN ANATOMY.

SENATUS, IN ROMAN ANTIQUITY, THE HALF OF AN AS.

SENA, IN BOTANY. SEE CASSIA.

SENA, IN BOTANY. SEE CASSIA.

SENA, IN BOTANY. SEE CASSIA.

SENA, IN BOTANY. SEE CASSIA.

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SENATOR, IN GENERAL, DENOTES A MEMBER OF THE SENATE.

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SENATOR, IN GENERAL, DENOTES A MEMBER OF THE SENATE.
which falls into the Atlantic ocean, in 16° N. lat., whence the gum-fenega is imported.

SENECAL, a term anciently used for steward or major-domo.

SENS, a town of Champagne, in France, situated on the river Yonne, sixty miles south-east of Paris.

SENSATION, in philosophy, the act of perceiving external objects, by means of the senses.

SENSE, a faculty of the soul, whereby it perceives external objects, by means of the impressions they make on certain organs of the body. These organs of sensation are commonly reckoned five, viz. the eye, whereby we see objects; the ear, which enables us to hear sounds; the nose, by which we receive the ideas of different smells; the palate, by which we judge of tastes; and the cutis, or skin, which enables us to feel the different forms, hardnes, or softnes of bodies. See Anatomy, p. 289, 293, 295, 303; Optics, p. 391; and Pneumatics.

SENSITIVE plant, in botany. See Mimosa.

SENTENCE, in Scots law. See Law, Tit. xxxii, &c.

SENTENCES, a period or set of words, composed of a fparry matter greatly debased by earth, fermenting with acids, and in great part dissolved by them, and calcining in a moderate fire.

SENTENCE, in grammar, a period or set of words, composed of a fparry matter greatly debased by earth, fermenting with acids, and in great part dissolved by them, and calcining in a moderate fire.

SEPULCHRE, a tomb, or place destined for the interment of the dead. This term is chiefly used in speaking of the burying places of the ancients, those of the moderns being usually called tombs. Sepulchres were held sacred and inviolable, and the care taken of them has always been held a religious duty, grounded on the fear of God, and the belief of the soul's immortality. Those who have searched or violated them have been thought odious by all nations, and were always severely punished.

SEPULCHRES, in anatomy, an inclosure, or partition, a term applied to several parts of the body which serve to separate one part from another.

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into Flanders, by the counts thereof; many also came into England. This order was however suppressed by pope Innocent VIII who gave its revenues and effects to that of our Lady of Bethlehem; which also becoming extinct, they were belittled on the knights of St John of Jerusalem. But the suppression did not take effect in Poland, where they still subsist, as also in several provinces of Germany. These follow the rule of St. Auguf- tine.

**Knights of the holy Sepulchre**, a military order, established in Palestine about the year 1114.

The knights of this order in Flanders chose Philip II, king of Spain, for their master in 1558, and afterwards his son; but the grand master of the order of Malta prevailed on the last to reign; and when afterwards the duke of Nevers assumed the fame quality in France, the fame grand master, by his interest and credit, procured a like renunciation of him, and a confirmation of the union of this order to that of Malta.

**SEQUELS**, in Scots law. See Law, Tit. xvi. 12.

**SEQUESTRATION**, in Scots law. See Law, Tit. xix. 10 and xx. 12.

**SEQUIN**, a gold-coin, struck at Venice, and in several parts of the grand seignior's dominions.

**SERAGLIO**, a Peruvian word, which signifies the palace of a prince or lord; in which the houfes of the ambassadors of England, France, &c. are, at Constantinople, called their seraglios. But the term seraglio is used by way of eminence, for the palace of the grand seignior at Constantinople, where he keeps his court, in which his concubines are lodged, and where the youth are trained up for the principal posts of the empire. It is in form of a triangle, about two miles round, at the end of the promontory Chrysoferos, now called the Seraglio-point; the buildings extend to the top of the hill, and from thence there are gardens that reach to the sea. The outward appearance is not very beautiful, the architecture being irregular, consisting of separate edifices, in the manner of pavilions and domes. The old seraglio is the palace where the grand seignior's old mistresses are kept.

The ladies of the harem, which is the part allotted to the women, is a collection of young beautiful girls, who, on their admission, are committed to the charge of some old lady, and taught music, dancing, and other accomplishments. These frequently play and dance before the grand seignior, while others entertain him with their conversation. Belonged to the ladies, there are a great many black eunuchs, and female slaves, in the seraglio, whose business it is to guard and wait upon them.

**SERAPH, or SERAPHIM**, a spirit of the highest rank in the hierarchy of angels; who are thus called from their being supposed to be most inflamed with divine love, by their nearer and more immediate attendance at the throne of God, and to communicate their fervour to the remotest and inferior orders.

**SERAPHIC**, burning or inflamed with love or zeal, like a seraphim: thus St. Bonaventure is called the seraphic doctor, from his abundant zeal and fervour.

**SERAPIAS**, in botany, a genus of the gynandria diandria class. The nectarium is oval and gibbous, with an oval lip. There are five species, two of them natives of Britain, viz. the latifolia, or broad-leaved bastard hellebore; and the linifolia, or white-flowered bastard hellebore.

**SERENAIDE**, a kind of concert given in the night, by a lover to his mistress, under her window. These sometimes only consist of instrumental music, but at other times voices are added: the music and long composed for these occasions are also called serenades.

**SERENE**, a title of honour given to several princes, and to the principal magistrates of republics. The king of England, the republic and the doge of Venice, and the children of the king of Spain, are called Most Serene: and when the pope, or the sacred college, write to the emperor, to kings, or the doge, they give them no other title: in like manner the emperor gives no other title to any king, except to the king of France.

**SERGE**, a woolen stuff manufactured in a loom, of which there are various kinds, denominated either from their different qualities, or from the places where they are wrought; the most considerable of which is the London serge, which is highly valued abroad, and of which a manufacture has been for some years carried on in France.

**SERGEANT, or SERJEANT at law**, or of the cafes, is the highest degree taken at the common law, as that of doctor is of the civil law; and as these are supposed to be most learned and experienced in the practice of the courts, there is one court appointed for them to plead in by themselves, which is the common-pleas, where the common law of England is most strictly observed; but they are not restrained from pleading in any other court, where the judges, who cannot have that honour till they have taken the degree of serjeant at law, call them brothers.

**SERJEANT at arms**, or mace, an officer appointed to attend the person of the king; to arrest traitors, and such persons of quality as offend; and to attend the lord high steward when sitting in judgment on a traitor.

The number of these officers is by statute limited to that of thirty.

**SERGEANT, in war**, is an inferior officer in a company of foot, or troop of dragoons, armed with a halbard, and appointed to see discipline observed, to teach the soldiers the exercise of their arms, and to order, stricten, and form ranks, files, &c.

**SERICUM**, See Silk.

**SERIES, in general**, denotes a continued succession of things in the same order, and having the same relation or connexion with each other: in this sense we say, a series of emperors, kings, bishops, &c.

**SERIES, in mathematicks**, is a number of terms, whether of numbers or quantities, increasing or decreasing in a given proportion. See Algebra, p. 88.

**SERIPHIUM**, in botany, a genus of the gynandria monogastrina class. The calyx is imbricated; the corolla consists of separate edifices, in the manner of pavilions and domes. There are gardens that reach to the sea. The outward appearance is not very beautiful, the architecture being irregular, consisting of separate edifices, in the manner of pavilions and domes. The old seraglio is the palace where the grand seignior's old mistresses are kept.

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**SERENAIDE**, a kind of concert given in the night, by a lover to his mistress, under her window. These sometimes only consist of instrumental music, but at other times voices are added: the music and long composed for these occasions are also called serenades.

**SERENE**, a title of honour given to several princes, and to the principal magistrates of republics. The king of England, the republic and the doge of Venice, and the children of the king of Spain, are called Most Serene: and when the pope, or the sacred college, write to the emperor, to kings, or the doge, they give them no other title: in like manner the emperor gives no other title to any king, except to the king of France.

**SERGE**, a woolen stuff manufactured in a loom, of which there are various kinds, denominated either from their different qualities, or from the places where they are wrought; the most considerable of which is the London serge, which is highly valued abroad, and of which a manufacture has been for some years carried on in France.

**SERGEANT, or SERJEANT at law**, or of the cases, is the highest degree taken at the common law, as that of doctor is of the civil law; and as these are supposed to be most learned and experienced in the practice of the courts, there is one court appointed for them to plead in by themselves, which is the common-pleas, where the common law of England is most strictly observed; but they are not restrained from pleading in any other court, where the judges, who cannot have that honour till they have taken the degree of serjeant at law, call them brothers.

**SERJEANT at arms**, or mace, an officer appointed to attend the person of the king; to arrest traitors, and such persons of quality as offend; and to attend the lord high steward when sitting in judgment on a traitor.

The number of these officers is by statute limited to that of thirty.

**SERGEANT, in war**, is an inferior officer in a company of foot, or troop of dragoons, armed with a halbard, and appointed to see discipline observed, to teach the soldiers the exercise of their arms, and to order, stricten, and form ranks, files, &c.

**SERICUM**, See Silk.

**SERIES, in general**, denotes a continued succession of things in the same order, and having the same relation or connexion with each other: in this sense we say, a series of emperors, kings, bishops, &c.

**SERIES, in mathematicks**, is a number of terms, whether of numbers or quantities, increasing or decreasing in a given proportion. See Algebra, p. 88.

**SERIPHIUM**, in botany, a genus of the gynandria monogastrina class. The calyx is imbricated; the corolla consists of separate edifices, in the manner of pavilions and domes. There are gardens that reach to the sea. The outward appearance is not very beautiful, the architecture being irregular, consisting of separate edifices, in the manner of pavilions and domes. The old seraglio is the palace where the grand seignior's old mistresses are kept.

The ladies of the harem, which is the part allotted to the women, is a collection of young beautiful girls, who, on their admission, are committed to the charge of some old lady, and taught music, dancing, and other accomplishments. These frequently play and dance before the grand seignior, while others entertain him with their conversation. Belonged to the ladies, there are a great many black eunuchs, and female slaves, in the seraglio, whose business it is to guard and wait upon them.

**SERAPH, or SERAPHIM**, a spirit of the highest rank in the hierarchy of angels; who are thus called from their being supposed to be most inflamed with divine love, by their nearer and more immediate attendance at the throne of God, and to communicate their fervour to the remotest and inferior orders.

**SERAPHIC**, burning or inflamed with love or zeal, like a seraphim: thus St. Bonaventure is called the seraphic doctor, from his abundant zeal and fervour.

**SERAPIAS**, in botany, a genus of the gynandria diandria class. The nectarium is oval and gibbous, with an oval lip. There are five species, two of them natives of Britain, viz. the latifolia, or broad-leaved bastard hellebore; and the linifolia, or white-flowered bastard hellebore.
The Virginian snake-root obtained its name, as being accounted a specific against venomous bites: but whatever truth there may be in that, it is undoubtedly an excellent diuretic, diaphoretic, and alepharmac medicine, and consequently good in inflammatory and malignant fevers; it is also a powerful antiscptic, and its dose is from four to ten or fifteen grains in powder.

SERPENTARIUS, in astronomy. See Astronomy, p. 487.

SERPENTINE, in general, denotes any thing that resembles a serpent: hence, the worm or pipe of a stick, twisted in a spiral manner, is termed a terpentine worm.

SERRATED, in general, something indented, or notched, in the manner of a saw; a term much used in the description of the leaves of plants.

SERRATULA, in botany, a genus of the genenia polygama class. The calix is somewhat cylindrical, imbriated, and blunt. There are 16 species of them natives of Britain, viz. the tinctoria, or saw-wort; the alpina, or mountain saw-wort; and the arvensis, or corn saw-wort.

SERRATUS, in anatomy, a name given to several muscles, from their resemblance to a saw. See Anatomy, Part II.

SERVANT, a term or relation signifying a person who owes and pays a limited obedience for a certain time, to another in quality of master. See Law, Tit. vii. 34.

SERVIETISTS, a name given to the modern antitrinitarians, from their being supposed to be the followers of Michael Servetus, who, in the year 1599, was burnt at Geneva, together with his books.

SERVIA, a province of European Turkey, bounded by the Save and the Danube, on the north; by Bulgaria, on the east; by Albania and Macedon, on the south; and by Bofnia and Dalmatia, on the west.

SERVICE OF EIRS, in Scots law. See Law, Tit. xxvii. 22, &c.

SERVITES, a religious order in the church of Rome, founded about the year 1233, by seven Florentine merchants, who, with the approbation of the bishop of Florence, renounced the world, and lived together in a religious community on mount Senar, two leagues from that city.

SERVITOR, in the university of Oxford, a student who attends on another for his maintenance and learning.

SERVITUDNE, in Scots law. See Law, Tit. xvi. 1, &c.

SERUM, a thin, transparent, faintish liquor, which makes a considerable part in the mass of blood. See Blood.

SESAMOIDA, in anatomy. See Anatomy, p. 488.

SESAMUM, in botany, a genus of the didynamia angiosperma class. The calyx consists of five segments; the corolla is campanulated, with five segments; the stigma is lanceolated; and the capsule has four cells. There are two species, both natives of India.

The seeds of this plant, upon expression, yield a larger quantity of oil than almost any other known vegetable; among the Indians, they are used for food.

SESELI, in botany, a genus of the pentandria digynia class. The umbel is globular; the involucrum consists of many leaves; and the fruit is oval and frted. There are 13 species, only one of them, viz. the carufolia, or meadow-faxifrage, a native of Britain.
SHADER, in ichthyology. See Clupea.

SEYNE, a river of France, which rising in Montgomeriyshire, runs east till it enters Shropshire; and having passed by Shrewbury turns south, and discharges itself into the Bristol channel.

SEVILLE, a city of Spain, capital of the province of Andalusia, situated on the river Guadalquivir: in W. long. 6°, N. lat. 37° 15'.

SEWERS, in the household, an officer who comes in before the meat of a king or noblemen, to place and range it on the table.

SEWERS is also a passage or gutter made to carry water into the sea or a river, whereby to preserve the land, &c. from inundations and other annoyances.

SEX, something in the body which distinguishes male from female.

SEXAGENARY, something relating to the number sixty; thus sexagenary or sexagefimal arithmetick, is a method of computation proceeding by sixties. See Arithmetick, p. 418.

SEXAGESIMA, the second Sunday before Lent, or the third Sunday after Shrove-Sunday, to be called as being about the sixtieth day before Easter.

SEXAGESIMALS. See Arithmetick, p. 418.

SEXTANS, a sixteenth part of certain things. The Romans having divided their as into twelve ounces, or ases of liquor, or two cyathii.

SEXTILE, the position or aspect of two planets when at sixtieth degrees distance, or at the distance of two signs from one another.

SEXTON, a church-officer, whose business is to take care of the vessels, vestments, &c. belonging to the church, and to attend the minifter, church wardens, &c. at church.

SEXUATE, in music, denotes a mixed sort of triple which is beaten in double time. See Music.

SEXUALISTÆ, among botanical writers, those who have established the classes of plants upon the differences of the sexes and parts of fructification in plants, according to the modern method, as Linnaeus, &c. See Botany, p. 643.

SHAD, in ichthyology. See Clupea.

SHADOW, in optics, a privation or diminution of light, by the interposition of some opaque body; or it is a plane where the light is either altogether obstructed, or greatly weakened, by the interposition of some opaque body between it and the luminary.

SHADOW, in painting, an imitation of a real shadow, effected by gradually heightening and darkening the colours of such figures as by their dispositions cannot receive any direct rays from the luminary that is supposed to enlighten the piece.

SHAFT of a column, in building, is the body thereof between the base and capital: so called from its straightness.

SHAFT, in mining, is the pit or hollow entrance into the mine.

SHAFFTBURY, a borough of Dorsetshire, twenty-five miles north-east of Dorchester; from whence the noble family of Cooper took the title of earl. It sends two members to parliament.

SHAG, in ornithology. See PELICANUS.

SHAGREEN, or CHAGREEN, in commerce, a kind of grained-leather, prepared, as is supposed, of the skin of a species of Squalus, or hound-fish, called the shagree, or shagrain; and much used in covering cases, books, &c.

SHAKLES, in a ship, are the rings with which the ports are shut fast, by lashing the port-bar to them. There also shakles put upon bilbow-bolts, for confining the men who have deserved corporal punishment.

SHAMBLES, among miners, a sort of niches, or landing places, left at such distances in the adits of mines, that the hoestring-men may conveniently throw up the ore from shamble to shamble, till it comes to the top of the mine.

SHAMMY, or CHAMOIS-LEATHER, a kind of leather, dressed either in oil, or tanned; and much esteemed for its softness, pliancy, and being capable of bearing soap without hurt.

The true shammy is prepared of the skin of the chamois-goat. See CAPRA.

SHANK, in the menage, that part of a horse's fore leg which lies between the knee and the fetlock.

SHANKER, or CHANCRE, in medicine. See Medicine, p. 152.

SHANNON, the largest river in Ireland, which rising in the county of Leitrim, runs southwards, dividing the provinces of Leinster and Connaught; and then turning southerly, runs through the province of Munster; and passing by the city of Limeric, afterwards falls into the western or Atlantic ocean.

SHARE of a plough, that part which cuts the ground, the extremity forwards being covered with a sharp-pointed iron, called the point of the share; and the end of the wood behind, the tail of the share. See Agriculture, p. 54.

SHASTER, or Shastram, a sacred book, containing the religion of the Banians: it consists of three parts; the first of which contains their moral law; the second, the ceremonial; and the third delivers the peculiar observances for each tribe of Indians.

SHEAT, in a ship, are ropes bent to the clews of the

SHEETS, in a ship, are ropes bent to the clews of the

SHEATHING, in the seaman's language, is the casing that part of a plough, that part which cuts the ground, the extremity forwards being covered with a sharp-pointed iron, called the point of the share; and the end of the wood behind, the tail of the share. See Agriculture, p. 54.

SHEATH OF A PLUGH, a part falling through the beam, and 'fastened to the share. See Agriculture, p. 54.

SHEATING, in the seaman's language, is the casing that part of a ship which is to be under water, with fir board of an inch thick; first laying hair and tar, mixed together, under the boards, and then nailing them on, in order to prevent worms from eating the ship's bottom.

SHEATS, in a ship, are ropes bent to the clews of the
SHELL, in natural history, a hard, and as it were ftony
Shells, those found buried at great depths in earth,
SHELL, among miners, the same with what they other-
SHEKEL, in Jewifh antiquity, an ancient coin, worth 2 s.
SHELTIE, a small but strong kind of horse, so called from
SHIELDS, a port-town of the bishopric of Durham, first-
SHIELRDIA, in botany, a genus of plants belonging
SHIELD, in heraldry, the escutcheon or field on which the
Sheriff in Scots law. See Law, Tit. iv. 1.
SHEW-BREAD, among the Hebrews, the name given
to those loaves of bread which the priests placed every
Shetland, or Zetland, where they are produced.
As to the formation of a shell, it is now generally al-
lowed to be formed by a viscous fluid composed of glue,
and several sandy particles of an exquisite fineness, which
are transmitted through an infinite number of little chan-
nels to the pores where it transpires, condenses, and
hardens. When the animal increases in bulk, and the
body of animals, and not from the shell, as some have
imagined.
SHELLS, those found buried at great depths in earth,
and often imbedded in the hardest stones. These felle
shells, as well as those found lying on the sea-shore,
make an excellent manure, especially for cold clayey
lands; upon which it does not produce nearly so great
an effect for the two first years, as it does in the succe-
eding ones; the reason of which is, that it is not then
sufficiently mixed, but in succeeding time it breaks itself
into a number of very small particles, and these all be-
come intimately blended with the molecules of earth,
and produce their effect more properly.
SHELTER, a small but strong kind of horse, so called from
Shetland, or Zetland, where they are produced.
SHEPPY, an island at the mouth of the river Medway,
making part of the county of Kent.
SHERARDIA, in botany, a genus of plants belonging
to the tetrandra monogynia class. The corolla consists
of one funnel-shaped petal; and there are two seeds hav-
ing three teeth. The species are three, only one of
them, viz. the arvensis, or little field-madder, a native
or Britain.
SHERBORN, a market-town, twelve miles south-west of
York.
SHERBRO, a fort at the mouth of the river Sherbro, in
Guinea, formerly in the possession of the English.
SHERENESS, a fort on the north-west part of the isle of
Sheppey, situated at the mouth of the river Medway, to
defend its entrance.
SHERIFF, an officer in each county of England, nomi-
nated by the king, invested with a judicial and ministerial
power, and who takes place of every nobleman in the
county during the time of his office.
SHERIFF in Scots law. See Law, Tit. iv. 1.
SHEW-BREAD, among the Hebrews, the name given
to those loaves of bread which the priests placed every
SHEEP, in zoology. See Ovis.
SHEERING, in the sea-language. When a ship is not flea-
ered hastily, they say the sheers, or go sheering; or
when at anchor they go in and out, by means of the
current of the tide, they also say the sheers.
SHEFFIELD, a market-town of Yorkshire, 38 miles
south-west of York.
SHEFFORD, a market-town of Bedfordshire, seven miles
south-west of Bedford.
SHEFFNEL, a market-town of Shropshire, fourteen miles
east of Shrewbury.
SHEIK, an officer in the mosques of Egypt, whose busi-
ness is the same with that of the imans of Constantinople.
SHEIK-BELLET, in the Turkish affairs, a magistrate, an-
twering to the mayor of a city with us.
SHELDs, a port-town of the bishopric of Durham, situ-
ated at the mouth of the river Tyne, eight miles east of
Newcastle.
SHEKEL, in Jewish antiquity, an ancient coin, worth 2 s.
and 3d. sterling.
SHILL, among miners, the same with what they other-
wise call fall ground, or fall country; being that part of
the internal structure of the earth, which they find lying
even; and in an orderly manner, and evidently having
retained its primitive form and situation.
SHELL, in natural history, a hard, and as it were ftony
covering, with which certain animals are defended, and
thence called shell-fish.
As to the formation of a shell, it is now generally al-
lowed to be formed by a viscous fluid composed of glue,
and several sandy particles of an exquisite fineness, which
are transmitted through an infinite number of little chan-
nels to the pores where it transpires, condenses, and
hardens. When the animal increases in bulk, and the
body of animals, and not from the shell, as some have
imagined.

Preventer
Thus we have pointed out the external parts, masts, yards, and pendants in Plate CXLIX. In Plate CXLIX. is represented the sections of a first-rate ship of war, shewing the inside thereof: where A is the head; containing, 1, The stem. 2, The knee of the head, or cut water. 3, The lower and upper keel. 4, The after deck. 5, The figure. 6, The gratings. 7, The brackets. 8, The false stem. 9, The breast-hooks. 10, The haufd hole. 11, The bulk head, forward. 12, The cat-head. 13, The catbook. 14, Necessaries, seats. 15, The manger within board. 16, The bowsprit. 17, The forecastle. 18, The partners of the forecastle. 19, The gun wells. 20, The belfry. 21, The funnel for the smoke. 22, The gangway going off the forecastle. 23, The forecastle guns.

In the forecastle, 24, The door of the bulk head, forward. 25, The officers cabins. 26, The stait-cake. 27, The fore top sail sheet bits. 28, The beams. 29, The car lines.

D, The middle gun-deck forward. 30, The fore-jeer bits. 31, The oven and furnace of copper. 32, The captain's cook-room. 33, The ladder, or way up into the forecastle.

E, The lower gun-deck forward. 34, The knots fore and aft. 35, The sprikettins, or the first streak next to each deck; the next under the beams being called clamps. 36, The beams of the middle gun-deck, fore and aft. 37, The car-lines of the middle gun-deck, fore and aft. 38, The fore bits. 39, The after, or main bits. 40, The hatchway to the gunner's and boat-swan's fore-rooms. 41, The jeer capstan.


I, The orlop a midships. 63, The cable tire. 64, The main hatchway.

K, The lower gun-deck a midships. 65, The ladder leading up to the middle gun-deck. 66, The lower tire or ports.

L, The middle gun-deck a midships. 67, The middle tire ports. 68, The entering port. 69, The main jeer bits. 70, Twisted pillars or slantons. 71, The capstan. 72, The gratings. 73, The ladder leading to the upper deck.


N, Abaft the main mast. 84, The gang-way off the quarter-deck. 85, The bulkhead of the coach. 86, The stair-case down to the middle gun-deck. 87, The beams.
of the upper deck. 88. The gratings about the main-
mast. 89. The coach, or council-chamber. 90. The
stair-case up to the quarter-deck.
O, The quarter-deck. 91. The beams. 92. The car-
lines. 93. The partners of the mizen mast. 94. The
gangway up to the poop. 95. The bulk-head of the cuddy.
P, The poop. 96. The trumpeter's cabin. 97. The
taffarel.
Q, The captain-lieutenant's cabin.
R, The cuddy, usually divided for the master and se-
cretary's officers.
S, The state-room, out of which is made the bed-chamber,
and other conveniences for the commander in chief.
98, The entrance into the gallery. 99, The bulk-head of the
great cabin. 100. The stern-lights and after galleries.
T, The ward-room, allotted for the lieutenants and
land-officers. 101, The lower gallery. 102. The steer-
age and bulk head of the ward-room. 103, The whip-
staff, commanding the tiller. 104, The after-stair-case
down to the lower gun-deck.
V, Several officers cabins abaft the main-mast, where
the soldiers generally keep guard.
W, The gun-room. 105. The tiller commanding the rudder. 106.
The rudder. 107. The stern-post. 108. The
tiller-tranfom. 109. The several tranfoms, viz.
1, 2, 3, 4, 5. 110. The gun-room ports, or stern chafe.
111, The bread-room scuttle, out of the gun-room. 112.
The main capton. 112. The main capton. 113. The
pall of the capton. 114. The partner. 115, The bulk-
head of the bread room.
X, The bread-room. Y, The steward's room, where all
provisions are weighed and served out. Z, The cock-pit,
where are subdivisions for the purfer, the surgeon, and
his mates.
A A, The platform, or orlop, where provision is made
for the wounded in time of service. 116. The hold abaft
the main-mast. 117. The step of the mizen mast. 118.
The keelson, or false keelson. 119. The dead-wood, or ri-
fing.

Different kinds of Ships. All ships at first were of the same
form, whatever uses they were designed for; but the
various ends of navigation, some of which were bet-
ter answered by one form, some by another, soon gave
place to the many varieties of ships. 1. The bilander, (Plate CXLIX, fig. 2.) which has
rigging and sails not unlike a hoy, only broader and
flatter; bilanders are seldom above twenty-four tons, and
can lie nearer the wind than a vessel with cross-sails can
do. 2. Bomb-veeffels, (ibid. fig. 3.) have sometimes
three masts, and square sails, as represented; but they
are also frequently ketch-fashion, with one mast and a
design. 3. Brigantines (ibid. fig. 4.) are vessels made ufe of for laying down or
felling the masts fixed on its deck, for fetting ships mads. 7. Ketches (ibid fig. 8.) are fitted with two mads; and their main-
mast and top-sail stand square as those of ships do, but
their fore-sail and jibbs as those of hoy's do. 8. Lighters
(ibid. fig. 9.) are veffels made ufe of for laying down or
shifting the masts, for bringing ahore or carrying on
board ships cables, anchors, &c. 9. Pinks (ibid. fig. 10.)
fail with three masts, ship-fashion; but are round sterned, with a small projection above the rudder. 10. Punts (ibid. fig. 11.) are built square, and used about the docks for fetching clay and other ferrices as the master shipwright wants them for. 11. Shallop (ibid. fig. 12.) is a small light vessel, with only a small main and fore mast, and lug sails, to haul up and let down on occasion. 12. Sloops (ibid. fig. 13.) have only one mast, with shoulder of motion, square, lug, and smack sails. 13. Smacks (ibid. fig. 14.) are transporting vessels, with one mast, and an half sprit-sail. 14. Yachts (ibid. fig. 15.) have only one mast, with an half sprit or smack sail, and sometimes ketch-fashion.

The most celebrated ships of antiquity are those of Ptolemy Philopater. One was 280 cubits long, 38 broad, and 48 high, each cubit being 1 English foot 5½ inches, and carried 400 rowers, 400 sailors and 3000 soldiers. Another which the same prince made to sail on the Nile, we are told, was half a stadium long. Yet these were nothing in comparison with Hiero’s ship, built under the direction of Archimedes; on the structure whereof Mohsen wrote a whole volume. There was wood enough employed in it to make 50 galleys: it had all the variety of apartments of a palace; such as banqueting-rooms, galleries, gardens, inlaid ponds, stables, mills, baths, and a temple to Venus. It was encompassed with an iron rampart, eight towers, with walls and bulwarks, furnished with machines of war; particularly one, which threw a stone of 300 pounds, or a dart 12 cubits long, the space of half a mile, with many other particulars related by Athenagoras.

Construction of Ships. Naval architecture may be divided into three principal parts: 1. To give the ship such a figure and proportion as may suit the service she is designed for. 2. To find the true form of all the pieces of timber that shall be necessary to compose such a solid. 3. To make proper accommodations for guns, ammunition, provisions, and apartments for all the officers, and likewise room for the cargo.

As to the first part, the length of the keel, greatest breadth, depth in the hold, height between decks and in the wale, and sometimes the height and breadth of the wing-transom, in ships for the merchants service, are agreed on by contract; and from these dimensions the builder forms a draught suitable to the trade the ship is designed for. The first thing that is generally done, is to lay down the keel, the stem, and stern-post, upon the centre-plane, or plane supposed to pass through the middle line of the keel, stem, and stern-post, cutting the ship in two halves lengthwise. They next determine the proper height of the midship timber, where a perpendicular is erected, and is generally about two thirds of the keel, before the stern-post; on this line the given depth of the hold is let off, from the upper side of the keel; to obtain which point, the thickness of all the timber and plank must be added to the height agreed on. This being fixed, will enable us to determine the upper-height of the extreme or greatest breadth of the ship; which, sometimes, is that very point; and from the same place the lower height of the breadth must be determined. The two main heights of the breadth-lines, which nearly unite above and below, are next determined. The height of the breadth-line of the top timber is next formed; being limited in the midship by contract, but above and below only by the judgment and fancy of the artist. If a square stern is designed, the breadth at the wing-transom is limited, being generally about two thirds of the greatest breadth. The artist next fixes the breadth of the top-timber, and then describes the two half-breadth lines. After these are formed the places where the several timbers are fixed; and for forming the midship-frame, radii are affumed at pleasure, till the sweeps are made to please the fancy and judgment of the artist. When this midship-frame is formed, a pattern or mould is made to fit exactly to the curve, and the dead-rising, or water-line; and by this and a hollow mould, all the timbers are formed, as far as the rising line, which is parallel to the lower height of the breadth-line.

We come next to consider the upper-works, or all that is above water, called the dead-work; and here the ship must be narrower, by which means the will strain less by working the guns, and the main-fall will be easier trimmed, as the shrouds spread less than they would otherwise do. But though these advantages are gained by narrowing a ship above water, yet great care must be taken not to narrow her too much, lest there should not be sufficient room upon the upper deck for the guns to recoil. The security of the masts should likewise be considered, which require sufficient breadth to spread the shrouds: though this may be ascertained by enlarging the breadth of the channels.

Principal qualities belonging to Ships. A ship of war should carry her lower tier of guns four or five feet above water; a ship for the merchants service should flow the cargo well; and both of them should be made to go well, carry a good sail, steer well, and lie-to easily in the sea.

1. To make a ship carry a good sail, Mr Du Hamel recommends a flat floor-timber, and somewhat long, or the lower futtock pretty round; also a straight upper futtock, and the top timber to throw the breadth out aloof; and at any rate, to carry her main-deck as high as the lower-deck; for if the rigging be well adapted to such a body, and the upper-works heightened as much as possible so as all to concur to lower the centre of gravity, there will be no room to doubt of her carrying a good sail. 2. To make a ship steer well, and answer the least motion of the helm, the fashion-pieces should be well formed, the tuck carried pretty high, and the midship-frame carried pretty forward; also there should be a considerable greater draught of water abaft than afore, a great rake forward, and none abaft, and a snug quarter-deck and fore-castle: all these will make a ship steer well. 3. To make a ship carry her guns well out of the water, is effected by a long floor-timber, and not of great rising, a very full midship-frame, and low tuck, with light upper-works. 4. To make a ship go smoothly through the water, without pitching hard, her keel should be long, her floor long and not rising high afore or aft; the area or space contained in the fore-body should also be duly proportioned to that of the after-body, according to the respective weights they are to carry. 5. To make a ship keep a good wind, she should have a good length by the keel, not too broad, but pretty deep in the hold; which will make her floor-timber.
timber short, and rising great. As such a ship will meet with great resistance in the water going over the broad side, and but little when going a-head, it will not fall much to the leeward. Now some ship-builders imagine, that it is impollible to make a ship carry her guns well, carry a good sail, and be a prime sailor at the same time; because it requires a very full bottom to gain the two first qualities; and a sharp-bottomed ship will answer the latter; but when it is considered, that a full ship will carry a great deal more sail than a sharp one, a good artist may so form the body as to have all these three good qualities united, and likewise steer well; for which purpose, Mr Du Hamel recommends somewhat more in length than has been commonly practiced.

SHIPTON, a market-town, twenty-four miles south-east of Worcester.

SHIRE, in geography, signifies the same as county; being originally derived from a Saxon word which signifies to divide.

SHIVERS, in the sea language, names given to the little rollers or round wheels of pulleys.

SHORT-HAND WRITING.

AS STENOGRAPHY, or the Art of Short-hand writing, when well understood, and rendered familiar by practice, is attended with many valuable consequences, we shall, without attempting to enumerate the infinite variety of systems that have been published, furnish our readers with that system which appears to be the most easy, beautiful, and expeditious, and at the same time calculated for general use.

PART I.

THE Alphabet being the foundation upon which the perfection of the art depends, great care must be taken to establish it in the best manner. All the simple sounds must be represented by the shortest marks possible. We must, therefore, not only reject the complex marks established by custom in our common alphabet, but also those letters themselves whose sounds may always be signified by others; and simple marks must be provided for such simple sounds as are by custom represented by two letters a-piece: for which reason, it is necessary to examine the alphabet, and to fix the number of characters, before we proceed to investigate the marks which are to represent them. First, then, let us consider what number of consonants may be requisite. We shall afterwards treat of the vowels, which are to be represented by points or dots.

The consonants, according to our usual reckoning, are, b, c, d, f, g, h, j, k, l, m, n, o, p, q, r, s, t, v, w, x, y, z. But custom differs from nature in inferring the letters c, g, w, x, y, and in omitting sh, zh, th, dh, ch: for c having always either the sound of k or s, q that of koo, w of oo, x of ks, and y of i; in an alphabet according to nature none of these could have found a place: and sh, zh, th, dh, ch, representing single consonantal sounds as much as ph does, whose power is that of f, ought all to have been denoted by single characters, as most of them are in the alphabets of other languages.

The natural alphabet, therefore, might have been taken for our short-hand one, rejecting the superfluous letters e, q, w, x, y, and inferting in their stead sh, zh, th, dh, ch: but having some marks that were not conveniently applicable to any other purpose, and it being a compendium to represent two letters by a single character, as in the q and x, and some ease to the reader to retain at the beginning of words the w and y, to which he has been long accustomed; we shall, totally rejecting the c, appropriate distinct marks to denote q, x, w, y, when they are initial letters; not scrupling however, in other situations, if it prove more convenient, to denote them by k, ks, wo and h, respectively.

Zh never had any particular mark to signify it by; and custom has, for a long period of time, ceased to make any distinction in writing between the th and dh: and as the adherence to nature in making nice distinctions, where custom has not, would be so far, in this case, from serving any valuable purpose of short-hand, that it would rather, on the contrary, render the learning to write and read it more difficult, we have, in pursuance of our plan, complied with custom in dropping the zh, and marking the sounds both of th and dh by the same character.

S and z bear the same relation to each other, that the wh and ab do; and the sound of z in our customary way of writing is very frequently expressed by s, except in cases when it occurs at the beginning of words, which happen but very seldom. These considerations induce us to secure the great convenience which arises from signifying both s and.
and z by one mark. And, for a like reason, we shall make one mark representative both of f and v. The idea of the place will easily discover, to a man tolerably acquainted with English, which of the two it must there represent; and the reader will be taught, when the characters are appropriated to the consonants, that, in most cases, entirely to remove any little ambiguity that possibly might arise from it. Our alphabet will then consist of the following consonants, viz. b, d, ʃ, v, g, b, j, k, l, m, n, p, q, r, s, t, w, x, y, ch, sh, th.

The number of our consonants being thus settled, and the reasons for fixing upon that number being given; the next business must be, to invent as many simple marks, easy to be made and distinguished from each other, as are necessarily required to represent them. They must be simple, if brevity be consulted; and they must be easily distinguishable from each other, to avoid the confusion arising from mistaking one letter for another.

Nature affords us four straight lines, sufficiently distinguishable from each other, by their horizontal, perpendicular, and inclined position, to execute our design by; (see Plate C.L. No. 1.) but it affords only these four. In this scarcity of straight lines, recourse must be had to curved ones for a further supply. The four straight lines being in the following manner, that is to say, the horizontal upwards and downwards, the perpendicular and inclined ones to the right and left, will each of them furnish two more very good short-hand marks; ibid. No. 2.

The number of marks thus increased still falls short of supplying our wants. The best expedient to remedy this defect, is the addition of a little twirl to the beginning of as many of the foregoing marks as there will be occasion for. It is easily and quickly made, when the marks are formed separately; and the twirled marks are joined to preceding ones in as little time as the plain ones. No. 3, 4.

A sufficient number of proper marks being thus obtained, it remains that each of them be appropriated to the particular consonant which it is to represent. Easy as this may seem, it is, however, a point of the greatest nicety; and demands, not only the most careful consideration, but also the most laborious application to continual trials and alterations. A short-hand alphabet may have all its characters simple, easy, and distinguishable, when separately formed; and yet not be a perfect one. To merit that title, it is further requisite, that they be so contrived and adjusted, that all the consonants occurring in any word may be easily, beautifully, and interlineally joined together, betwixt two given parallel lines, without taking off the pen. Experience has taught quick writers even of long-hand, that the joining all the letters of a word together contributes much to dispatch, though they are obliged to make little additional strokes for that purpose.

Let us then consider, to what particular consonant each of our marks is to be appropriated; and begin with the four straight lines.

The first of these lines, viz. the horizontal, as it goes straight forwards, can never exceed the limits of the given parallels, whatever part it begins from; and therefore, in a short-hand formed for lineal beauty, it must be appropriated to that consonant, which, of all others: occurs the oft, and challenges, of right, the most commodious character for beauty and dispatch. Now the consonant that occurs the most frequently in our language (and perhaps in most others) is the r; which has a property, peculiar to itself, of mixing with other consonants before or after it, without the intervention of a vowel. The plural number of most of our substantives, and the third person singular of our verbs, are formed by it; which must occasion the most frequent repetition of it; so that, being undoubtedly the commonest of all our consonants, it must of necessity be denoted by the horizontal straight line.

The second straight line, or perpendicular, is also a very easy mark, and, separately made, even preferable to the other; but as, in union with others, it may endanger our defribing below the line, it must therefore be allotted to a common consonant, and one also that will the least occasion us to run that hazard. Now the s has, in fact, these and other properties that entitle it to this perpendicular straight line.

The third straight line, by its peculiar inclination, is adapted to a very easy and convenient joining with other characters; because our customary method of inclining the letters, in common writing, teaches us to form it with equal readiness upwards or downwards, as the keeping the previous or following marks within the prescribed parallels shall require. The consonant, therefore, that claims this character, is the t, which makes so many of our double consonants (as we call them) and admits any other single one to follow it immediately. The straight line then which slopes downwards to the left, is r.

The last line of the four straight ones, by its direction or slope to the right, is awkward to make (and therefore never is made) upwards, like the foregoing, to which it unites the most readily. Its properties, upon trial, fix it with the occurrence of the consonants f or v.

The twirl being formed to the left hand in these four marks, (No. 5.) disqualifies them from an easy junction with any preceding consonant. They must then, for that reason, be allotted to such consonants as occur the seldomst in the middle or at the end of words, or to such as may be otherwise signified when they do occur in such situations. Now the h, or j, are rarely to be met with in the middle of words, unless immediately preceded by some preposition, as inhamb, reject, etc. In which case, the reader will be taught hereafter how to write them; and when x and y are not at the beginning of words, they may be expressed by ks, and the dot for the vowel ſ respectively.

The properties of these four letters agreeing well with those of the four marks, luckily point out a use for four easy characters, which could not however have been conveniently allotted to any other consonants; and the following appropriation of them, upon trial, is found to be the most commodious, viz. the first for h, the second for j, the third for x, and the fourth for y.

K is a very common consonant; and the frequency of its occurrence will be much increased by its being made so often representative of the rejected c, and ks of x: a character, therefore, which is not only easy to be made, but which will also join readily with all the rest, without running either above or below the line, must be appropriated to it. The horizontal straight line, with the additional twirl, will, for these reasons, be the most commodious. But as the distinguishing the k and q, at the beginning of words especially, will, in some degree, facilitate the reading; the horizontal straight line with the twirl above is made for k, with the twirl below for q, when they are initial letters.
In all other cafes, there are two marks are used promiscuously for & or g, whenever a more easy, beautiful junction may by that means be obtained; the one joining evidently much better with the characters which are written upwards, the other with those downwards.

But to give a detail of all the reasons for the appropriation of each particular mark to each consonant, would prove tedious. Most of them cannot escape the observation of an attentive practiser as he goes along. It will, therefore, be sufficient to assure the reader, that no pains was prove tedious. Most of them cannot escape the observation of each particular mark to each consonant, would

better with the characters which are written upwards, the other with those downwards.

Two marks are allotted to b; (see Table of the Alphabet, Plate CL.) The first of these marks is the bell when separate, or not well with the / or r. For familiar reasons, some other of the consonants have more than one mark allotted to them.

One or other of the two marks appointed for w is always to be used when it is an initial letter; in other situations we scruple not to express it by a dot in the o or ou place, writing pour for power; especially if it joins not well with the preceding consonant, or no great ambiguity arises thereby.

The marks being thus adjusted to the particular consonants which they are to represent, let us see how any peculiar arrangement, or subjoined, or intermediate vowel may be affixed to any of these consonants, as occasion shall require.

In separate letters there is no difficulty, there being five distinguishable places for any given vowel or point, either preceding or following the consonant: reckoning, therefore, the vowels a, e, i, o, u, according to the established numbers and sequence, a is to be placed at the beginning of the consonant, e at the end of the first quarter, i at the end of the second quarter, that is, the middle, o at the end of the third quarter, and u at the end of the consonant itself.

In the perpendicular and inclined letters, the vowels which precede are placed upon the left hand; those which follow, upon the right; because we write from left to right; and, for example, at, et, it, ot, ut; sa, te, ti, to, tu. No. 6.

In the horizontal letters, the vowels which precede are placed above; those which follow, below; because we write from top to bottom; as, at, et, it, os, ut; sa, te, ti, to, tu. No. 7.

In the semicircular letters, the vowels a, e, o, u, are placed upon the left hand, the i above when they precede, and the contrary when they follow, agreeably to the two foregoing remarks; as, am, em, im, om, um; ma, me, mi, mo, mu. No. 8.

A vowel between two consonants may be referred to either, and therefore seems to have two places; but in letters which form an angle when joined, this is the case of i only; for a and e can only be placed immediately after the first consonant, o and u only before the last; left a and e, if placed before the last, should, in the narrow part of the angle, be confounded with u and o after the first; as, rat, ret, rit, rot, rut. No. 9.

This twofold place of i may be of use in distinguishing, when thought necessary, the short i from the long one, by making it short when placed immediately after the first consonant, long when before the second; as quit, quits.

The great difficulty of learning the true pronunciation of our language, occasioned chiefly by our perplexed, various, and confused way of spelling, has been always matter of much complaint with all foreigners who have attempted to learn it. But this absurd irregularity is by far the most remarkable, in the customary management, or rather mismanagement of the vowels. It is hardly possible to give a rule for them, against which the exceptions will not be almost as numerous as the agreeing inftances. How frequently do we put two, nay sometimes three vowels, to express the sound of one only? What, for example, has the e and a to do in the word beauty? The short-hand writer, however, is not embarrassed with any of these difficulties. He, totally disregarding the common way of spelling, is to insert only such letters as are pronounced; and must consequently write the word beauty thus: buty. But the insertion of more vowels than are necessary to the sound is not the only instance of irregularity to be met with;—there being more than five vowel sounds in our language; and custom, having allotted only five letters to signify them all by, often makes one vowel express two or three different ones. nay, even diphthongs or combinations of vowels. We therefore, taking the advantage which custom in this case affords us, shall extend the power of our dots or points to the same degree: The fairness and propriety of doing this will more fully appear upon a particular examination of all the vowels in their order.

And firft, in common writing, the letter a has three powers, viz. that of a, of ai or ay, and of au or aw; as in the words father, false, fall, or amen, able, altar; which are pronounced all one as if they had been written father, false, fal, or amen, able, altar: so that we are fairly authorized to extend the power of our vowel or point to the same degree in all other inftances.

The vowel e sometimes expresses singly the sound that two of them are often made for, as, he, me, we; where its sound is the same as that of two e's, as in see, tree, agree, &c. We are therefore free to use one e in this case, whenever it suits our purpose, as well as for ea, ey, ei, eo; for of what use is the latter of these vowels in pea, press, beijer, people, but to puzzle children and foreigners?

The same irregularity and confusion is observable in the customary management of the other vowels, i, o, and u; they each of them singly expressing different sounds, which altogether are denoted at other times by several different combinations of them. The vowel i, for instance, when it is short, is founded in English as ee, agreeable to the pronunciation of it in most foreign languages; when long, it has always the sound of a diphthong, or combination of the two vowel-sounds, (which we might express by the open a or au, and the short i or ee;) which found or diphthong is also sometimes expressed by ei, as fill, file, fail, fin, join.

In like manner, the vowel o has several different founds; as in the words pol, pole, do: the founds of the o in pole, is sometimes expressed by ow, as to poor; sometimes by ou, asoward; sometimes by oo, as solid; its found in do, by oo, ough, as too, two, through.

And lastly, the found of u (which is always really a diph-
thong, expreflible by the combination of the two vowel sounds ee and oo) is denoted in a great variety of ways in our common spelling, viz. by u, oe, eu, iu, iu, ugh, eu, you; as in the words tune, due, few, adieu, view, ugh, beauty, you. We are therefore certainly at liberty to represent all these by a point, in the place of the vowel u; and thus not only all the single vowels, but all the combinations of them, are expreflible by the shorteft and eafilfst of all marks, viz. a dot in the place of the vowel of nearest sound.

We will now proceed to examine what further use we can make of these marks for the purpofes of short-hand. And as numeral figures exhibit to us a kind of short-hand with which every one is acquainted, an allusion to them will perhaps explain what we have to say hereupon.

Obferve, then, the figures by which the words or numbers, one, five, four, fix, are expreffed in the Roman characters, which are likewise fome of thofe which we make ufe of: I, V, IV, VI. Here we fee the figure I is confidered in three different situations, as flanding by itfelf, clofe before, and clofe after another figure: and has accordingly three different powers, of numeration, infubraction, and addition. When it flands by itfelf, its name and power is one; when it is clofe to, or belongs to another figure, it lofes its name, yet retains fomething relative to its power, by leffening or increafing that other figure by one; and has accordingly three different situations, as flanding by itfelf, flanding before another figure, and clofe after another figure: and has accordingly three different powers, viz. as flanding by itfelf, as flanding before another figure, and as flanding after another figure.

All the reft of the confonants are to be confidered in the fame threefold light, viz. as flanding by itfelf, as flanding by themselves, as flanded before other marks; and muft, accordingly, have a power of denoting fome common word, preposition, or termination, in which that confonant is found.

This is the general rule; but in practice there are few prepositions and terminations neceffary or ufeful beftides thofe feft down in the alphabetical table. This rule is very convenient in fome cafes; as where the confonants of which the word is compos'd join not well together, or cannot be kept within the parallels; for inftance, in behold, inhabit, deposit, N° 13. and affords a great contrivance in others, as underwritten, diflfuion, direction, N° 14. But here it is to be obferved, that, in placing the termination, regard-
is to be had to the vowel's place with respect to the line, and not to its place after the last consonant, (except that happens to be one or other of the three horizontal characters s, k, or q), as in the above word direction: the s is drawn from the o's place in the line, but it is in the o's place with respect to the last consonant r, which appears evidently to have begun at the bottom of the line. But when s, k, or q, immediately precede the termination, regard is then to be had to the vowel's place after the letter: as assumption affection. (N° 15. first and second examples.) The plural number of the termination is denoted by adding a little s; as  : ... definations, (ibid. third and fourth examples)

Before the learner begins to write by the preceding alphabet, it may not be improper to premise a few observations upon the form and respective proportions of the letters, and the ways of joining the curved ones with the most cafe and elegance.

First, All the perpendicular and inclined letters (that is, all the letters except s, k, q, m, n, cb, and g,) are made to touch two parallel lines, the distance of which is measured by the perpendicular straight line t, as in N° 16.; but, however, these letters are sometimes, for greater convenience, made of half-size, and two of them included between the parallels, as in the seventh and eighth examples, N° 16.

The letters m, n, cb, and g, are semicircles; the diameter of which is the t, and their radius or height is rather more than one third part of the t.

The letters formed from the three straight lines t, r, and f, are segments of larger circles, whose chords are the letters t, r, and f, respectively.

It must be observed, however, that it is not necessary, nor indeed scarce possible, that these proportions should be exactly kept, especially in quick writing; but they are given here, because the nearer they are kept to, the more beautiful the writing appears.

Secondly, When m and n are joined together, they are not each of them to be made complete; but a part is to be cut off from each of them; and in the same manner the inclined letters, when joined with m or n, are not made complete, but, running into one another, lose each a part, as N° 17. So the rest of the curve line letters, when joined together, are made to run into one another smoothly; avoiding, by this means, that slopping of the pen which the making of any angle necessarily occasions; so as for instance mp is not written, as in the first example N° 18.; but as in the second, part of the curved line being in common both to the m and p.

Thirdly, The twirl is always made at the beginning, never at the end of any letter; whenever, therefore, the six last characters (N° 18.) occur, they must be supposed to have been begun from the bottom of the line.—The general rule is, That all perpendicular and inclined letters are to be begun from the top, and drawn downwards; but in all instances, in which the inclined letters (N° 19.) will join better with the preceding or following marks if drawn upwards, they must be drawn in that direction, as in these words, N° 20.

Fourthly, The initial or final vowels (the e mute excepted) are generally expressed, and the middle ones omitted, except in cases where there are many words confounding the name consonants which might be liable to be taken for one another. But all words which have one consonant only (except those in the table of the alphabet, which are expressed by the letter alone) must always have the proper vowel point expressed, as by, to, &c. because these little words are, as it were, the keys of the sentences in which they are found.

Fifthly, Few monosyllables beginning with a vowel are immediately followed with either h or w; for which reason, these characters, having a point before them, are always expressed, with the proper vowel between them; as hat, hit, hot, but, and and and, met, met, met, met, N° 21.

Sixthly, As the horizontal letters s, k, and the curved ones m, n, cb, and g, may be written at the top, or bottom, or any part of the line, the vowel following them may be expressed by their situation betwixt the parallels; as fan, fan, man, man N° 22.

Seventhly, The first mark for the th in the table, not joining well with the mark for r, which, however, is very frequently combined with it; and the other, th, being, by reason of our customary method of leaning the letters the contrary way in common writing, not to readily made; t may be put for th, when the adjoining letter is of half size only, as thr, rhs, rhs, rhs, N° 23. In other cases, a letter of half size signifies that the adjoining one is to be resolved into two letters rr, rr, in the first example N° 24; for here the r being twice as long in proportion to the t as it ought to have been had only one r been designed, shows, that in this case the r of double length denotes rr: but, in the second example, the last character does not signify r, for it cannot be resolved into //; but it may into //; for if you divide the last character into two halves, the lower is our mark for r; in like manner, the third example is ft.—When there is no other consonant to be joined to the inclined letters f or r, the lengthening of them by a greater inclination than usual denotes that they are to be resolved into two letters rr, rr, or 0, 0, or 0; as in the three first examples, N° 25. error, fine, fpeoff; but when two t's form a word, as for example the word taught, or, as we should spell it, tuat. this expedient cannot be used, without going either above or below the line, which is not to be done upon any account whatsoever. In this case a little break must be made in the t, to show that there are two t's, N° 25. This must be confessed to be not altogether regular, and conformable to our rules of joining the letters; and, had many instances occurred, their frequency would have furnished a just objection against our alphabet; but on the contrary, the repetition of the t forming fewer words than that of the other consonants, was one reason of appropriating the perpendicular line to the t. The word taught being the only one that often occurs in practice.

Eightly, In some few instances, where a letter joins not well with the preceding one, as the g with any drawn downwards, the cb with any upwards, and the j with neither; we scruple not to borrow the opposite one, or some other of nearly the same found, in its stead; writing instead of voyage, voyach, for voyage; church, for church; macheffy, for majefty; N° 26. And when n happens to be at the bottom of the line, and is followed by d; for the sake of easy joining, we write p instead of the d, as in the first example N° 27. fmp for finp; and few words in our language ending in np, this can cause little ambiguity.

Ninthly, Cm and ch occurring very frequently, for the sake of dispatch we shorten the marks for k and q, when followed by m or n, as in the third and fifth examples, N° 27.
N° 27. These cannot be mistaken for oh and g, the twirl being on the contrary side.

Tenthly, The first mark, N° 28. placed close after a word, denotes that there is one syllable still wanting to complete the word, and ing being a very common final syllable, it is often so denoted as, being, writing, N° 28.

Eleventhly, A point standing by itself has a power, as well as the consonant marks, of representing a common word. At the top of the line, it signifies the particle a; as, a man: in the middle l, or eye; as, I will, his eye: in the o's place p; as, I Lord; at the bottom you; as, you will. N° 29.

Twelfthly, The common way of writing numbers being very compendious we generally use it when numbers occur. The comma, as it does not resemble any of our short-hand marks, may always be used; but when a full stop word at the top of the line, it signifies the particle a; as, being on the contrary side.

In writing words (as before observed) we join all the consonants, that are wanted, together; to which, if they suffice to distinguish a word, it is needless to add any of its vowels. As for instance, to write the word *sirs* we join the four consonants of which it is composed into one continued mark or figure comprised within the due limits, as in N° 30. first example: for if, without regarding the limits, we should make it as in example second, the letters would be the same indeed; but the direction in this, and all similar cases, is evidently more incommodious. When therefore, there are different ways of joining the same letters together, we must accustom ourselves to the best, or most lineal. The sameness of the entire figure, as well as that of its composing letters, is worth the writer’s while to maintain; and also facilitates mutual reading between the several practisers of the same method. There is a kind of mechanism in the case, by which the attention, being left fatigued with any deviations of unusual appearance, easily apprehends the meaning of that which is more conformable to a standard.

Though the letters *sir* are abundantly descriptive of the word *sirs*; yet if any one pleases, he may add the point for the vowel i, (as in the example, N° 20.) to suggest the word to him at first, until he can read it readily without that assistance.

In single words, the chief difficulty is, to unlearn the unnatural and perplexed method of speaking to which we have been long habituated. In this word *practice*, for example, the consonant c is pronounced as k in the first syllable, and as f in the second, and the vowel e has no pronunciation at all. But, being used to these difficulties, it is now become one to know the word by its true and genuine spelling according to our short-hand alphabet, viz. *praktis*.

It may highly perplex a careless writer of new characters, to decipher the true sense thereof; though it should be easy enough to know it, by a little application and practice. But what child would not sooner learn to read this same sentence, if, after being taught the use of his alphabet, he should have it thus written?—*It may help a careless writer of new characters, to decipher the true sense thereof; though it should be easy enough to know it, by a little application and practice.*

Instead, therefore, of scrupling to return from such customary rules as children are first initiated in, to a more jutl and alphabetical way of writing short-hand, men may easily be taught, when ripened into some acquaintance with their mother-tongue, to reverse the liberties perpetually taken in long-hand; that is, instead of employing more letters than is precisely necessary to express the sound of words, they may make use of fewer, not only displacing such as are needless to the sound, but such also as may be omitted, and yet leave the sense of the words easily discoverable. If they can tell what is wanting, it is all one as if it was there; the less expression there is, so much the better for the purposes of brevity, which justifies the greatest omissions, provided what is left be intelligible.

And though the omission of the vowels in the middle of words may, for a while at the first, make it difficult for a learner to read even his own writing without hesitation; yet that difficulty will certainly vanish, in proportion as the short hand marks become familiar to him, as it arises, not so much from that omission, as from the strange and un-English appearances which the characters make to his eye, and which, for that reason, do not suggest to him the consonants, for which they stand, so immediately, but that the attention of the mind is necessarily taken up in recollecting them one by one; whereas, did they appear so familiar and well known to him as all to be apprehended in one view, he would soon discover the word, though all the middle vowels were left out. If any one doubts this, he may soon convince himself, by writing in the common long-hand exactly the same letters which he had written before in the short-hand characters; and if he can read it with ease when so transcribed, he may be certain that a little custom will make the reading of short-hand every whit as easy to him.

And now, the way being sufficiently cleared before him, the learner, after he has, by repeated trials, acquired a facility of forming, with tolerable exactness, all the letters of the alphabet separately, and of remembering what particular consonant each of them represents, may proceed to join two or three of the marks together; writing at first only short words, and frequently trying different ways of joining the marks, in order to discover the best, and most elegant. Several of them being formed almost as easily upwards as downwards, he will find it convenient sometimes to begin from the top, sometimes from the bottom of the line, according to the nature of the mark which follows; and when two marks, which admit of being written downwards only, come together, the line must be divided between them, making each of them half the usual depth, as in examples first and second, N° 31. and, in some very rare instances, he will be forced to make them three deep, as *flupid* (example third,) except he chooses to make use of the expedient of borrowing the b, a letter not very different in sound, writing *flubid* for *flupid*, as in the fourth example.

That the learner may proceed with the greater ease and certainty, we have given specimens of writing according to the above rules. (Plates CLI, CLI,) for his imitation. He ought to make himself fully master of the first specimen, by reading and copying it over and over with great care, until it becomes quite natural and familiar to him, before he proceeds to the second; and he ought in the same manner to make himself thoroughly acquainted with the second, before he proceeds to the third. Thus moving with flow, but sure steps, he will in a very few days find, that every difficulty has disappeared, and that nothing remains but to practice till the habit is acquired. If he has the curiosity to compare the number of strokes and dots in his first specimen...
PART II.

An alphabet, formed upon the most just and natural plan, by which, with the help of a few general rules, all the words of the language to which it is particularly adapted, may be easily, nearly, and speedily written, will not be sufficient to satisfy the expectations of an inquisitive reader; who must be felicitous, that however complete the alphabet may be, yet many compendious applications of it may be obtained by a proper inquiry into the nature of our language, and the abbreviations which it admits of. He will not be satisfied with being taught only how to express all the letters of a word by the shortest and easiest strokes, but will also require further instruction how to describe intelligibly words and sentences by as few of those strokes as possible. To investigate, from a few things given, many which are omitted, will be found no unpleasant nor unprofitable exercise of the learner’s sagacity; and if the few be properly given, the sense of the passage, and a due attention to the omission of these more certain, and also less difficult, than the unexperienced can easily imagine.—Without some such rules of abbreviation, one end of short-hand, that of following a speaker, would scarcely be attainable.

Before the invention of the art of printing, the tediousness of writing all the words at full length put the copyers of books upon forming many ways of abbreviating them, as appears in all manuscripts. In those of the New Testament, we find many principal words expressed by their initial and final letters only, with a dash over them. In Latin manuscripts, those terminations, by which the relations of words to one another are in that language usually expressed, were generally omitted; nor was there any need of writing them at length; for the principal word being given, the sense of the passage, and a due attention to the omission of these more certain, and also less difficult, than the unexperienced can easily imagine.—Without some such rules of abbreviation, the other end of short-hand, that of expressing the thoughts of a speaker, would scarcely be attainable.

But it will be proper, before we proceed further in this art of abbreviation, to advert the learner, who is apt to be too eager to pull forward, not to embarrass himself with it, till, by a competent practice of writing according to the rules laid down in the first part, he is become so well acquainted with the characters, as to be able to write and read them with as much ease as his own common hand. The best way to learn any art is to proceed by degrees, not venturing upon a second step before the first is perfectly mastered. And it is evident, that this method of proceeding is, on this occasion, particularly necessary: for though, in many sentences, the sense, and the particular construction of the words, may plainly enough point out such of them, as are described with unusual brevity; yet how shall an unpractised learner, unable to embrace in one view the words denoted by the preceding and following marks, determine what the intermediate contracted ones must needs be? But if he will have patience to abstain from this second part, until he can write readily, and read without hesitation whatever is written, according to the rules of the first, he may rest assured that he will meet with little more difficulty in reading words contracted than he did in those written more at length, provided that the rules of abbreviation be duly attended to. But, if the reader expects that we are to give him every particular manner of abbreviation which can possibly be invented, he will be disappointed. The principal and most useful rules are given; and it is left to the sagacity of the practitioner, by observing the nature of these, and proceeding upon the same principles, to make such further advances as his occasions may require. It would be vain to pretend to have exhausted a subject which is as extensive as the language itself in which we write; and consequently may be carried further and further by every one, in proportion to his skill in the language, and his knowledge of the subject treated upon.

The learner has been already taught how to write all the consonants of any word by one continued mark, those words only excepted which may be more briefly described by the help of prepositions and terminations. He may now advance a step further, and join together such short words as are either represented by the letters of the alphabet alone; or such as, by their frequent occurrence, are become so familiar, as to be readily known, though denoted by their first consonants only. This will be found a greater saving of time than can easily be imagined; and must therefore, when dispatch is required, be done in all instances in which they may be joined neatly and without ambiguity.

Rule I. The different times and modes of the verbs are generally expressed, in the English language, by the help of other verbs, for that reason called auxiliary; as, will, shall, have, bad, can, could, may, must, be, &c. These must, upon that account, occur very frequently; and, being signified by their first consonant, they may be joined to one another; as, can be, will have or has been, to be, ought to be, must be, &c. Plate CLIII N° 1. and, when the negative particle not intervenes, it may be denoted by its first consonant, and be joined with them; as, cannot be, N° 2. will not be, have not been, not to be, ought not to be, N° 3. When these joinings are, by a little practice, become easy to the learner, he may proceed further, and join the preceding pronouns to these auxiliary verbs; as, he must be, he cannot be, N° 4. This can occasion no ambiguity: for though he was taught in his alphabet, that these two marks (N° 5.) denoted, the former have and the latter bad; yet, when placed immediately before must and can, their signification shows that they cannot, in that case, signify have and bad, those auxiliaries never admitting of such an arrangement. And further, as we and he are often dropped in common speech and writing, as 'tis for he will, we've for we have; and, for the sake of joining, he omitted in short-hand; as, he will, he will not be, they have been. N° 6.

Rule II. The learner was taught in the first part, that in...
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<th>No.</th>
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The Lord's prayer: "Our Father which art in heaven, Hallowed be thy name. Thy kingdom come. Thy will be done in earth as it is in heaven. Give us this day our daily bread. Forgive us our trespasses as we forgive them that trespass against us. And lead us not into temptation, but deliver us from evil. Amen."
in writing all the confonants of which any word was composed, the beginnings of the marks which follow must always be joined to the ends of those which precede them: Whenever, therefore, they are joined in any other manner, it is to denote, that each particular mark signifies a whole word, and not a single letter: as for example, the particular way of joining the letters in the first example, \( \text{No } 7 \), is a sufficient indication that they were not intended to represent a word consisting of those two confonants, but two words; and the \( n \) in the middle of the line standing for \( in \), and the \( t \) for \( th \), in the \( th \) may be written as in that example. So again, the second example, \( \text{No } 7 \), denotes two words; and the \( s \) being drawn from the place of \( s \), shows the latter of them to be \( s \); and through the straight perpendicular line usually represents the article \( the \), yet, in that situation, it cannot possibly do so; for that article can never come immediately before a verb, but the pronouns very frequently do. It is may therefore be very commodiously written as in that second example; and it is not to be, as it is, since it is, may be written as in \( \text{No } 8 \), and by dropping \( s \), as before, we may write it\( 's \), for it was, it was not \( s \); it\( ' \)ere to be, for \( it \) were to be; it seems to be; as in \( \text{No } 9 \). For the \( s \) being drawn from the place of \( s \), shows that it must be either it \( s \)---to be, or it \( s \)---to be; and it seems to be is so very common a phrase, that it will not give much trouble to the reader, though written in this concise manner.

Rule III. Points being the shortest of all marks, it would argue a great want of economy, as well as invention, not to make all the use of them that can be made consistently with the regularity of our system. The power of representing prepositions and terminations, which was allotted to the confonant marks, could not be given to the points: for, in that situation, they stand for the vowels; and all the distinguishable places, both before and after the confonant marks, are already taken up by the five vowels: but a point placed directly over or under the beginning or end of any of those marks, has as yet had no signification annexed to it. As for instance, in the second example, \( \text{No } 10 \), the point being so placed, that if the \( t \) was produced, it would pass through it, is very distinguishable from all the vowels. All derivative substantives may therefore be very conveniently represented by making the point stand for the substantive derived from the word at the end of which it is placed; so the two examples, \( \text{No } 10 \), signify forget, forgetfulness.---But as there are derivative adjectives and adverbs as well as substantives, it will be a great compendium to represent them also by points, distinguishable, by their situation, both from the substantive and the vowel points; which may be done by placing them in a line, which, if produced, would pass through the substantive point; and would also be perpendicular to the last confonant mark; and by making one placed before the substantive-point to signify the adjective, one after to signify the adverb: As, forgetful, forgetfulness, \( \text{No } 11 \); reasonable, reasonably, \( \text{No } 12 \); sufficient, sufficiency, sufficiently, \( \text{No } 13 \).

Rule IV. Although the above described mode of abbreviation is very extensive, there being in our language a great number of long words derived from short ones; yet it is far from being the only use which may be made of these adjective, substantive, and adverb points. In all discourses whatever, there must be some principal words, which, either by their more particular relation to the subject, or frequent occurrence, will be easily discoverable, however concisely written. If such words begin with a confonant, the first letter, if not the first vowel and confonant, with the adjective, substantive, or adverb point annexed, will suggest them immediately; and therefore will be, though a brief, yet a sufficient description of them. As for instance, if the following passage be transcribed out of a discourse upon the folly of worldly-mindedness, in common long-hand, after this manner, Our blessed Lord, always, \( \text{No } 16 \); altogether, occasion, accordingly, \( \text{No } 17 \); notwithstanding, opinion, perhaps, religion,
I'm preparing which is omitted.

Substantives, and the preposition connecting them may be confonants only, they may be joined together, placing a dot so, in English, if the two related substantives be such as may be readily known, even when represented by their first consonants only, they may be joined together, placing a dot at the point of their junction, to show that they are both substantives; and the preposition connecting them may be omitted, for it may as certainly and as readily be supplied by the reader as the cafes in Latin before mentioned. This consideration will therefore dictate the following rule, viz. That a dot placed at the point of concurrence of two consonant marks, as in No 20. denotes two substantives, of which those marks are the first consonants; and also that the latter is governed of, or connected to, the former, by some preposition which is omitted.

As for example, in this sentence, The sun or substance of all the commandments is contained in the two following, viz. the love of God, and the love of our neighbour; the words love of God may be wrote as in the last example, for as the particular situation of the dot denotes that both L and G are substantives, the article the before the full points will discover that it must be the love of God.

Or again, The love of money is the root of all evil; or, Seek ye first the kingdom of God, and his righteousness; these words love of money, and these other words kingdom of God, may be wrote as in No 21.

The articles a or the, in this and in many of the following ways of abbreviation, may, for the sake of joining, be omitted, as in the following sentence, Since the light of the gospel has shone upon the world, &c. the light of the gospel may be written as in No 20.

And further, though an adjective should precede either of the substantives, yet they may all three be represented by their first consonants joined together, with the dot always placed at the end of the first substantive. No difficulty can ever arise in distinguishing the adjective from the substantives. For, in the following sentence, The great goodness of God is manifest in all his dealings with his creatures; if these words, great goodness of God, be written as in No 22. the dot placed at the end of the second mark shows that it must be the first substantive, the third must therefore denote the latter substantive, and the first consequently the adjective. In like manner, in the following sentence, His Majesty the King of Great Britain, the words King of Great Britain may be wrote as in the first example, No 23. for the dot being placed at the end of the first mark, it is evident that the first must be a substantive; and a little attention to the usual arrangement of words in the English language will discover that the second must be an adjective, as adjectives generally precede the substantives to which they are related; there is therefore as much given as if it had been written in long-hand thus, His Majesty, the K— of G— B—; which, in a discourse concerning him, would be sufficient to discover that the contracted words must be King of Great Britain.

If each of the substantives have an adjective joined to them, there can be no difficulty, for the first and third must be adjectives, except in some rare instances in which the common order is sometimes changed, and the last adjective is put after its substantive, as in this, the good news of God Almighty: in such cases, either the last adjective must be separated from the rest of the mark; or, if joined, it must have the adjective dot annexed; and the good news of God Almighty may be written as in the second example, No 23.

This relation of substantives, which is expressed in Latin by the genitive case, in English by the preposition of, is by far the most common: but the rule is more extensive, and serves to express two substantives connected by any proposition whatsoever, as for, in, with, after, &c. provided that the context, or any particular words of the sentence, easily indicate not only the two substantives which are denoted by their first consonants, but also the proposition which ought to be inferred. As, for example, in this sentence, Happy is it for us, if, convinced by experience of the vanity of putting our trust in man, we place all our confidence in God, the three last words may be expressed as in the first example, No 24. For the context plainly points out the two substantives; and the verb place marks evidently, that the omitted preposition cannot be of, but must be in.

In this sentence, Our holy religion absolutely forbids all instances of revenge, our Saviour expressly commanding his disciples to return good for evil.—good for evil may be written as in the second example; for the verb return shows plainly that it cannot be good of evil, but must be good for evil. It may, perhaps, be objected here, that v is not the first letter of the word evil, but it must be observed, that the words of the rule are, That the dot denotes two substantives, of which those marks are the first consonants, not the first letters; and a word may sometimes be fo pointed out by others which accompany it, as to be easily discoverable, though the initial vowel be omitted.

It may not be improper to add another example or two for the better understanding of this rule; as thus, In this present state there is no such thing to be met with as pure annuitied pleasure or pain, good or evil; here below all things are mixed, pleasure with pain, good with evil. The latter part of the sentence, pleasure with pain, good with evil, may be wrote as in the two full marks No 25. for the word mixed requiring the preposition with after it, shows, that it cannot be p—o f — and g— of — v—, but must be p— with p— and g— with v—.

Or, He is now become quite blind. he cannot even distinguish light from darkness. The last three words may be wrote as in the third mark, No 25.

Or again, If we consider, that without health we cannot enjoy any of those pleasures which riches can procure; what man that estimates things according to their reality, rather than their appearance, would not prefer health to riches; or, would not choose health before riches. The three several expressions will be easily distinguished, though wrote all in the same manner, No 26.

Rule VI. The substantive point, placed before a single consonant
SHORT-HAND WRITING.

consonant mark, denotes, that the substantive represented by it is to be repeated, with some intervening preposition, as after, to, by; as for example, day after day, time to time, N° 27.

Rule VII. The substantive, adjective, or adverb point, placed before two or more consonant marks joined together, denotes two or more substantives, adjectives, or adverbs respectively, of which those marks are the first consonants, and also that they are connected by a conjunction.

As for example, Our blest Lord and Saviour Jesus Christ, by his death and passion, made a sufficient satisfaction and atonement for the sins of the whole world;—Lord and Saviour, death and passion, satisfaction and atonement, being wrote as in N° 28.

Or further, The precepts both of natural and revealed religion forbid us to do our neighbours any injury; example first, N° 29. Here the point shows, that both s and r are adjectives; and the word religion, to which they are connected, will immediately suggest the words natural and revealed.

Or, to add one other instance, What doth the Lord thy God require of thee, but to live soberly, righteously, and godly, in this present world? which surely would give very little trouble to fill up with the words soberly, righteously, and godly.

Thus any feries of substantives, adjectives, or adverbs, may be expressed by their first consonants joined together with the proper point prefixed. But we must not indulge ourselves in doing this at all adventures. It is only to be done in such instances, wherein the commonness of the phrase, or the nature of the subject, points out the words signified by those letters; or when the words, so briefly described, are such, that no other can be inferred in their stead consistently with the sense of the passage.

When great dispatch is required, as in the case of following a speaker, all omissions are allowable, which can afterwards be supplied by a careful attention to the idiom of the language, and to the connection of the contracted words with those which precede or follow them. And it may not be improper to observe, that greater or less liberties of contracting may be taken, in proportion as the speaker is more or less accurate in his language. For it is certain, that any contradictions, where the style is clear and regular, may be more easily deciphered, than where it is confused and embarrassed. It may happen, indeed, sometimes, that the words signified by such contractions will not occur at first sight; but a little thought will discover them; and the reader will find, that an attention of this fort will very agreeably and ingeniously lead him into a more perfect knowledge of the idiom of his own language.

Rule VIII. Many long words may be, and frequently are, expressed in common writing by their first syllable only, with a mark to show what is wanting, as multi— for multitude, cor— for correspondence. So in shorthand, long words, especially those in which the marks for the consonants will not join neatly, may be denoted by their first syllable, with as many points annexed as there are syllables wanting; as, multitude, correspondence, N° 30.

And when great dispatch is required, the points may be omitted, especially if the words do not begin with prepositions; as, satisfaction, difficulty, negligence, N° 31.

Rule IX. The power given to the consonant marks of representing prepositions and terminations, will enable us to write great numbers of long words after a very expeditious manner; for words beginning with prepositions may be denoted by their respective prepositions, together with the next consonant and vowel; and oftentimes with the next consonant only, adding to it the substantive, adjective, or adverb point, when necessary. As for instance, the first example, N° 32 expresses a word beginning with the two syllables de-li; and though there are many words which begin with those syllables, as deliberate, deliver, delicious, &c. yet if such a sentence as the following were to be written thus, He was not hasty in his resolution, but took time to deliberate;—about it, the word deliberate would immediately occur to every one.

The trouble of inferring the vowel may, in many instances, be saved, by beginning the consonant from that point after the preposition in which that vowel should be placed; as in example second, N° 32. the m beginning from the a's place after the t shows, that the next vowel after m is a, and the mark therefore is equivalent to transm—, which is a sufficient description of the word transmuted.

A few examples more will sufficiently explain this rule: as, recommend, recommendation, recommendatory, N° 33. resignation, resolution, consanguinity, N° 34. conveniently, superficially, N° 35.

The participles may be abbreviated after the same manner, by adding, instead of the points, the termination ing or ed to the latter consonant mark; as confidering, considered, N° 36.

Words beginning with double or treble propositions may be written after the same manner; as, misinformation, representation, misrepresentation, N° 37. incomprehensibility, example first, N° 38. The prepositions must always be joined together; and, if two consonants begin the next syllable, the writing of them both will help to disclose the remainder of the word; as misunderstanding, example second, N° 38.

It must appear plainly to every one, upon the least consideration, that the words in the foregoing instances are abbreviated. There can therefore be no danger of mistaking, for example, the mark N° 39. for some short word, such as daily, duly, &c. For, by our rule, the dis joined always signifies the preposition de: nor can it be a word consisting of the preposition de and the syllable li or ly only; for, if such a word had occurred, it would have been sooner written by joining the marks together, as N° 40. This way of writing therefore shows, that the word begins with the preposition de; that the next syllable is li; and that there are some other syllable, or syllables, wanting to complete it. Nor can the consonants in those examples in which the vowels were omitted, be mistaken for terminations; as in this example, N° 41. the k cannot be supposed to represent the termination ical; since it would be absurd to think of describing any word by its preposition and termination only: for as the

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Right mention of nothing of the new form of abbreviation.

For example, in the following sentences, this belongs to me; He made some good observations upon it; I want to dispose of my house; He agreed with me in opinion; —the words belongs, observations, disposed, agreed, may be written as in No. 46. And in these sentences, there was not the least difference between us; We must take particular care to guard against such passions as we find ourselves must liable to; As for his personal estate, he divided it amongst all his children in equal shares; —the words difference, guard, liable, and divided, may be wrote as in No. 47.

And it may be further observed, that as few English words end with the syllable to, the proposition to may for that reason be joined to the preceding word, which was directed to be signified by its first conjonant only. For the unusualness of the ending will be a sufficient hint, that the mark represents not one, but two words; and, therefore, this belongs to me, may be written as in example first, No. 48, and liable to, satisfactory to, and subject to, may be wrote as in the second, third, and fourth examples, the — in this last infance being made at the bottom of the line, to shew that the vowel following it is u. But if any one finds it difficult to write that upwards, he may, whenever it is necessary, distinguish the two last instances from one another, by inserting the u, and write subject to as in No. 49.

Other prepositions, which are denoted in the table of the alphabet by a single conjonant, may, in like manner, be joined to the preceding word; as in the example, He made some good observations upon it,—observations upon may be written as in No. 50. Nor will there be any great danger of the reader's being puzzled by mistaking such like marks for single words; for it will not often happen that the two conjonants of which they are composed will form any word, scarcely ever that they will form such a word as will suit the place and agree with the context. A little custom will therefore soon suggest to the learner, that the two marks must denote two words; the latter of which, being represented in his short-hand alphabet by the last conjonant mark, must for that reason immediately occur to him.

Rule XII. Prepositions generally require after them either a noun, or a pronoun. The pronouns being few in number, and in all languages used as substantives for nouns, must occur very frequently, and by that means soon become familiar to the reader; the pronoun, for that reason, may be joined to the preposition, without danger of creating any difficulty to the reader.

As for example, in these sentences, He gave it to me, He left it to my, to us, to our, to your, the words to me, to my, to us, to our, to your, may be wrote as in No. 51. The b, th, or wh, may, for the sake of joining, be dropped in the pronouns; which begin with those letters, as his, this, whom, &c. and we may write to his as in example first, No. 52, and to this as in example second; distinguishing, if it ever should be thought necessary, his from this, by the different situation of the point; to her and to their, as in example third; for a distinction between them cannot be made, as was done in the instance before, by the different placing of the point; but the sense of the passage will easily show which it must be. To whom, to those, or to whose, to which, to each, may be wrote as in the first four examples, No. 53. It was not in my power; in my, as in the
the fifth example. *It was thrown under my feet, He came and dwelt amongst us, You may depend upon me;* the words under my, amongst us, upon me, as in No. 54.

This rule is not to be restrained to those prepositions only which are denoted in the table of the alphabet by a single confonant, as among, under, upon, &c. but may be extended to others, which muft, in that cafe be represented by their confonant, and be joined to the pronoun; as, he did it with my content, writing with my as in No. 55. This will occasion no ambiguity, since we cannot in this place dignify the word-will; for fuch a fentence as, be did it will my content, would be neither fenfe nor grammar. Its ftitution in the fentence, and connection with the pronominal adjective my, plainly mark that it muft be some preposition which begins with w.

And though feveral prepositions fhoûd begin with the fame confonant, yet they muft be written in this manner, provided that the preceding or following words be fuch as will serve to diftinguish them, and fhew which of them muft needs there be meant; as in the following examples: He came privately and took it away without my knowledge; To flrop to fo mean an action was much beneath his dignity; It is beyond my reach. Without my may be written as with my, No. 55. and the words beneath his, beyond my, as in No. 56. Above may be diftinguifhed from beyound, by prefixing the initial vowel. Thus, in the following fentence, it is above my comprehension, above my may be wrote as in example firft, No. 57, and between them, before my, behind my, in thefe fentences, They divided it equally between them, He had the impudence to do it before my face. He did it fifty behind my back, may be wrote as in the three laft examples, No. 57.

But it is to be noted here, that when the prepositions themselves are abbreviated, as in thofe infances above, they cannot help to explain other words, as they did in thofe mentioned in the beginning of the 11th Rule, in which they were direcd to be written plainly; for it would be very puzzling indeed, if that word, which was to affift in explaining others, wanted explanation itfelf.

Rule XIII. After the learner has, by a little practice, made the laft method of abbreviation familiar to himself, he may venture to combine it with the foregoing, and join the preceding word, the preposition, and pronoun all together: and as he had learned before to write belongs to, as in example firft, No. 58. and as the laft rule taught him to write to me as in example focond, he may now join them all together, and write belongs to me, extends to us, agreed with me, depend upon me, as in No. 59. observations upon this, as in example firft, No. 60. and rebellion againft his, differences amongst his, as in the two following fentences, He was a notorious traitor and caught in actual rebellion againft his Majesty, He was an ill natured man, and always endeavouring to few dissensions amongst his neighbours, may be wrote as in No. 60.

When a pronoun, or a preposition and pronoun, follow the verb, and are thernselves followed by a preposition and pronominal adjective, they may all be joined together; as, I congratulated him upon his, &c. I consoled with him upon his, No. 61.

The words some, any, none, which, each, both, &c. followed by a preposition and pronoun, may, agreeably to this rule, be denoted by their firft confonants, and be joined to the preposition and pronoun; as, some of them, any of us, none of them, No. 62. both of them, which of them, each of them, No. 63. The firft dot is inferted to diftinguish the words from one another which begin with the fame confonant; as, none, any, &c. The latter dot muft never be omitted, as it is the appointed way of writing the pronouns when joined to prepositions; as, of them, No. 64.

Rule XIV. After the learner has for fome time accuftomed himfelf to the foregoing rule, he may advance a step further, and join the adverbs preceding the verbs, and the fubfiantives following the pronominal adjectives, to the verbs and adjectives refpectively, denoting both the adverbs and fubfiantives by their firft confonants, or at moft by their firft confonants and vowels; as for example, in this fentence, you may safely deped upon my word may (land as in No. 65. *

Difficult as this may seem to a beginner, yet habit, and a little refleétion upon the nature of our language, will quickly render it easy to him. His own experience will soon convince him, that contradictions, when judiciously made, may be more certainly and easily read than the unexperienced are apt to imagine. It may, perhaps, for a while at the firft, be a good method to take the contradictions to pieces, writing in long-hand exactly what is given in short-hand. The foregoing coercion fo tranfcribed would ftand thus, you may fay—d—upon my w. Here the preposition upon will foon fuggeft, that the preceding word, beginning with the confonant d, muft be deped; and the word denoted by its initial letters fa, coming between the auxiliary may, and the verb depend, is by its fition, according to the usual arrangement of words in our language, plainly enough marked to be an adverb; fo that it is nearly the fame as if it had been written thus, You may fa—by depend upon my w. *A rule too plain a descripition to prove a flumbling-block to any attentive reader.

Rule XV. Many common phrafes, formed by a fubfiantive preceded by the prepositions with, without, in, &c. and followed by to, of, &c. may be very conveniently conected; as, with regard, refeft, or reference to, No. 66. example firft. He safely broke his promise, without any regard to his honour; without any regard to his, as in example fecond; in relation to, as in the third example; in order to, in confefion, comparifon, or confideration of, in obedience to your, No. 67; by reafon of his, by virtue of his, No. 68. (in this laft inftance, the proportionally little 6 shows, that the mark following it is to be divided into two letters;) upon account of, in the power of, No. 69.

Rule XVI. Common adverbal phrafes are, in like manner, often denoted by their initial confonants joined together; as, for the fnture, at the fame time, at prefent, in this manner, No. 70. in like manner, in a great meafe, in the fame manner, No. 71.; to fo much that, fo much the more, in the mean time, No. 72.; in general, in particular, No. 73.

And when the proportion of equality is exprfied by fo—as, or as—as, with some one word intervening, they may be all joined together; as, fo much as, as much as,
as well as, as long as, as good, or as great as, &c. No 74.

Rule XVII. The contractions which may be made when it is or it was are followed by an adjective, and to or that, are so numerous, that we must content ourselves with giving a few of the most usual; as, it is impossible to, it was unnecessary to, it is contrary to, No 75; it is according to, it is observable that, it is evident that, it is not to be supposed that, &c. No 76.

The above methods of abbreviation are such as are of most common use and practice: and though they are not many in number, yet they are very extensive in their application; for a sentence can scarce occur in which one or other of them will not find a place. But yet we are far from pretending to have exhausted the subjedt. An accurate and diligent attention to the nature and idiom of our language may suggest others as useful and extensive as these. Proper care being taken to lay a right foundation, the legible ways of contracting will increase, in proportion to the writer's want of them. The more he writes, the more con- cievably he may venture to write, and yet be able to read his contractions with ease; provided that he builds them upon some known particularity of our language: for which rea- son we have been more solicitous to elucidate the grounds of our rules, than curious in the choice, or copious in the number of examples. But that the learner may have all the af- filiance necessary, we have furnished him with specimens, (Plates CLIII. CLIV. CLV) where he will find his rules exemplified; and as the last specimen is taken from a book not in every person's possession, we have given the passage in a note #.

But it may not be amiss, before we conclude, to make a remark or two upon abbreviations in general.—First, that in all the various ways that can be taken of contracting, (that is of describing words by some shorter method than that of writing all the consonants of which they consist,) care must be taken, when the contraction consists of two or more words joined together, that no one word of it be rep- resented by more than one character; and secondly, that the whole mark, by some means or other, if possible, be shown to be a contraction, as it has been generally done in the foregoing pages, either by the insertion of points in the middle of the marks, as No 77. (Plate CLIII.) for some of them; (which, when dispatch is required, is never practised to denote vowels in the middle of words;) or by the unusual ending of the mark, as No 78, for liable to, appears that; for few words (since the termination eth, so frequent in Scripture-language, is now almost grown obsolete) end in ; or by the unusual joining of the marks, as, in, the, it, is, &c. No 7. Otherwise the reader might be puzzled in hunting for some one word consoling of the letters which are written: whereas, as he knows it to be a contraction, he is not bewildered in his researches, but is at first directed the right road, and has nothing to do but to search after some word for every character, which will suit the description, and agree with the context.

And when contractions are judiciously made, the learner, provided he will observe the caution already given, (and which cannot be too often repeated), of beginning with the easel, and of not proceeding to a second, until the fist is become familiar, will certainly find the difficulty of deciphering them lessen every day.

But, supposing that there was more difficulty in the read- ing none by a secretary. It is true, there are divers for mandation Dom. Regis, by warrant from the Lords of the council. I have perused Dr. Rutillyn's Annals of King James the 11th, fol. 201, and Ruttten's, Vol. i. 458, and can find none by a warrant from a secretary. I have read Caleb, Selmers', and Littrens arguments upon that subjedt, but see nothing of a secretary's commitment. And it seems very strange, if such a power were lodged in this Rate-officer, that there should be no precedents for it in those times, when extrajudicial and general warrants were so frequent, that they became a grievance to the people, and such a one as laid the foundation for the petition of right.

I shall not controvert the power of the council at present, because it doth not appear to me a power quite unaccountable: but it first be- gan to be practised in Sir Lionel Jenkyn's time; and yet, even in 1678, when the high court of justice could not stop it, that council did not correct it. It is no- toriously known, that the chief justice Serggs was frequently and often sent for to Whitehall, to examine, and commit, and grant warrants. And hence since the council's practices, the secretaries of the council have thrown that burden off from themselves upon their secretaries under them, who have been sworn justices of the peace; and Mr. Sprigge, who accordingly executed the office of a justice of peace at Whitehall, and that frequently. It had been a question, Whether a chancellor, or keeper of the great seal, can commit; and the better opinion hath been, that he cannot. And it seems to be agreed by Gascoign's and other cases in Mirr's Reports, 851, and Adolphus, that his committment is illegal, unless for a cause within his jurisdiction as a court of equity; and the matter must be left to me. I must agree, that any man may apprehend another for felony or treason; but there is a vast difference between apprehending a traitor or felon upon suspicion or knowledge, and a formal com- mitment to prison with a charge of treason. And I am sure Mr. Attorney General will not insist upon this reason; for then the consequence will be, that any man may apprehend another for felony or treason, and lay it before the council; and I suppose that doctrine will scarce be al- lowed; though I think that any man may, as well as he. The reason of an appre- hending a traitor or felon upon suspicion or knowledge, and a formal com- mitment to prison with a charge of treason. And I am sure Mr. Attorney General will not insist upon that reason; for then the consequence will be, that any man may apprehend another for felony or treason. And I suppose that doctrine will scarce be allowed; though I think that any man may.-

And the precedents mentioned there upon each side, which are multitudes; there is no mark, as, in, the, it, is, &c. No 7. (Plate CLIII.) for foms of them; the whole mark, by some means or other, if possible, be shown to be a contraction, as it has been generally done in the foregoing pages, either by the insertion of points in the middle of the marks, as, in, the, it, is, &c. No 7. Otherwise the reader might be puzzled in hunting for some one word consoling of the letters which are written: whereas, as he knows it to be a contraction, he is not bewildered in his researches, but is at first directed the right road, and has nothing to do but to search after some word for every character, which will suit the description, and agree with the context.

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Part of Dr. Sherlock B. of Savow's 1st sermon with a few of the most common Contractions.

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Plate CIII

- lynxruum
ing of them; yet, provided that they may be certainly made out by due attention to the subject treated upon, and the idiom of the language, it will be sufficient: for the learner must be advertized, that these contractions are not design-
ed to be taught as the common standard method of writing short-hand upon all occasions.—That method which was taught in the first part, and which will be as easily read, upon a little practice, as common long-hand, will be found sufficiently short for all common purposes; and it should therefore be kept to when very great dispatch is not re-
quired.

Inventors of short-hand have generally introduced into their systems a multitude of arbitrary marks, to signify par-

The injudicious application of these arbitrary marks is not the only objection against them. They are not only burdensome to the memory, and tedious and difficult to be learned, but are forgot even by the writer himself, unless he sits down to decipher immediately whilst every thing is fresh in his memory.

These objections lie not against the above methods of abbreviation. They burden the memory with new and arbitrary marks, and with but few rules for the extension of the powers of the alphabetical characters; and the rules are so general, and applicable to such a multitude of cases perpetually occurring, that they give the system the advantage, even in point of expedition, over arbitrary marks, and at the same time leave the writing legible, whatever length of time intervenes, not only to the writer himself, but also to every fellow-practitioner of the same method.

S I A

SHOT, a denomination given to all sorts of balls for fire-
arms; those for cannon being of iron, and those for guns, pilots, &c. of lead.

SHOVELER, in ornithology. See ANAS.

SHOULDER bone, in anatomy. See ANATOMY, p. 175.

SHOULDER-BlADE. See ANATOMY, p. 176.

SHOWER, in meteorology, a cloud resolved into rain.

SHREW MOUSE. See Mus.

SHOVEL-HORN, in ornithology. See Anas.

SIBERIA, or Asiatic Russia, the most northern country of Asia, situated between Tibet on the east, and Labor on the west.

SIBIALDIA, in botany, a genus of the pentandria pentagynia class. The calix consists of ten segments, and the corolla of five petals inserted into the calyx; the stamens are placed on the side of the germen; and there are five seeds. The species are two, only one of them, viz. the pro-
cumbens, or bafballad cincquefoil, a native of Britain.

SICILY, the largest of all the Italian islands, anciently called Trinacria, from its triangular figure, it is situated between 12° and 16° E. long. and between 35° and 39° N. lat. being about one hundred and seventy miles long, and one hundred broad.

SHRINE, in ecclesiastical history, a case or box, to hold the relics of some saint.

SHROPSHIRE, a county of England, bounded by Chefsire on the north, by Staffordshire on the east, by Here-
fordshire on the south, and by Montgomeryshire on the west.

SHROVE-TUESDAY, is the Tuesday after Quinquagesima Sunday, or the day immediately preceding the first of Lent; being so called from the Saxon word Shrove, which signifies to confess, as having been employed by the people in time of popery, in confessing their sins, in order to receive the sacrament, and thereby qualify themselves for a more religious observance of Lent.

SHROWS, in a ship, are the great ropes which come down both sides of the masts, and are fastened below to the chains on the ship's side, and aloft to the top of the mast; being parcell'd and served in order to prevent the masts' falling them. The top-mast shrouds are fastened to the puttock-plates, by dead eyes and laniards, as the others are.

SHRUB, among naturalists, denotes a dwarf-tree, or a woody plant less than a tree; such are holly, box, priv-
et, &c.

SHUTTLE, in the manufactures, an instrument much used by weavers, in the middle of which is an eye, or cavity, wherein is inclosed the spool with the woof.

SI, in music, a seventh note or sound, added by Le Maire to the fix ancient notes invented by Guido Aretine, viz. ut, re, mi, fa, sol, la, si.

SIAM, the capital of a kingdom of the same name, in the Vol. III No. 94.
SIG (600) SIL

It is separated from Calabria, in Italy, by the straits of Messina, which, in the narrowest part, is not seven miles over.

SIDEROS, in botany, a genus of the monadelphia polyandria class. The calix and corolla of the male have each five segments; and these are three filaments; the calyx and corolla of the female are the same with those of the male; the style is trifid; and the drupe contains one seed. There are two species, none of them natives of Britain.

SIDA, in botany, a genus of the monadelphus polyandria class. The calyx is simple and angular; the style is divided into many parts; and there are many capsules, each containing one seed. There are 15 species, none of them natives of Britain.

SIDEREAL year. See Astronomy, p. 458.

SIDERIA, in natural history, the name of a genus of crs. It is used to express those altered in their figure by particles of iron. These are of a rhomboidal form, and composed only of fixed planes. Of this genus there are four known species: 1. A colorielves, Pellucid, and thin one, found in considerable quantities among the iron ores of the forest of Dean in Gloucestershire, and in other like places. 2. A dull, thick, and brown one, not uncommon in the same places with the former. And, 3. A black and very glossy kind, a fossil of very great beauty, found in the same place with the others, as also in Leicestershire and Suffolk.

SIDERITIS, in botany, a genus of the didynamia gymno sperma class. The flamina are within the tube of the corolla; and there is a short stigma over-lapping another one. The species are eleven, none of them natives of Britain.

SIDEROXYLUM, in botany, a genus of the pentandria class. The corolla consists of ten segments alternated crooked inwards; the stigma is simple; and the berry contains five seeds. There are three species, none of them natives of Britain.

SIDEMOUTH, a port-town of Devonshire, situated on a bay of the English channel, ten miles south-east of Exeter.

SIDON, or SAYD, a port-town of Palestine, in Arafic Turkey, seventy miles north of Jerusalem. It is still a place of some consideration, being the residence of a Turkish bakhsh.

SIDRA, an island of the Archipelago, situated at the entrance of the gulf of the Adriatic.

SIEGE, in the art of war, the encampment of an army before a fortified place, with a design to take it.

SIENNA, a city of Italy, in the duchy of Tuscany, situated thirty-six miles south of Florence.

SILK, is properly an animal fluid, hardened by the air, and in colour a brownish yellow. It breaks easily between the fingers, and does not stain the hands; is naturally of a smooth surface, and is readily diffusible in water, and melts freely into a butter-like substance in the mouth. It leaves no grittiness between the teeth, and does not ferment with acid menftra. It is found in the perpendicuilar fissures of rocks near the gold-mines at Strigonium in Hungary, and is supposed to be impregnated with the sulphur of that metal. It is a good astringent, and better than most of the barks in use.

SILENIUS, in botany, a genus of the decandria trigynia class. The corolla consists of five ungualciliated petals; and the capsule has three cells. There are 34 species, 6 of them natives of Britain.

SILESIA, a duchy belonging to the king of Prussia, two hundred miles long, and seventy broad: it is bounded by Brandenburgh on the north, by Poland on the east, by Hungary on the south, and by Moravia and Bohemia on the west.

SILESIAN earth, in the materia medica, a fine astringent balsam. It is very heavy, of a firm compact texture, and in colour of a brownish yellow. It breaks easily between the fingers, and does not stain the hand; is naturally of a smooth surface, and is readily diffusible in water, and melts freely into a butter-like substance in the mouth. It leaves no grittiness between the teeth, and does not ferment with acid menftra. It is found in the perpendicuilar fissures of rocks near the gold-mines at Strigonium in Hungary, and is supposed to be impregnated with the sulphur of that metal. It is a good astringent, and better than most of the barks in use.

SILICA, a term used by botanists to denote a pod.

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and for one thread will be shorter than the other, wrought together: otherwise we may with justice suspect that it is refuse silk, and cannot be equally drawn out and spun; for one thread will be shorter than the other, which is labour and loss.

...disposed, that the creatures can discharge their contents at pleasure at the mouth; and, according to the nature of the juices that are supplied with, furnish different sorts of silk from them; all the fluid contents of these vessels hardening in the air into that sort of thread that we find the web or balls of this creature consist of.

As soon as the silk-worm is arrived at the size and strength necessary for beginning his work, he makes his web; for it is thus they call that flight tissue which is the beginning and ground of this admirable work. This is his first day's employment. On the second he forms his folliculus or ball, and covers himself almost over with silk. The third day he is quite hid; and the following days employs himself in thickening and strengthening his ball; always working from one single end, which he never breaks by his own fault; and which is so fine, and so long, that those who have examined it attentively think they speak within compass, when they affirm, that each ball contains silk enough to reach the length of six English miles.

In ten days time the ball is in its perfection, and is now to be taken down from the branches of the mulberry tree, where the worms have hung it. But this point requires a deal of attention; for there are some worms more lazy than others; and it is very dangerous waiting till they make themselves a passage, which usually happens about the fifteenth day of the month.

The first, finest, and strongest balls are kept for the grain, the rest are carefully wound; or if it is desired to keep them all, or if there be more than can be well wound at once, they lay them for some time in an oven moderately hot, or else expose them for several days successively to the greatest heats of the sun, in order to kill the insect, which, without this precaution, would not fail to open itself a way to go and use those new wings abroad it has acquired within.

Ordinarily, they only wind the more perfect balls; those that are double, or too weak, or too coarse, are laid aside, not as altogether useless, but that, being improper for winding, they are referred to be drawn out into skeins. The balls are of different colours; the most common are yellow, orange colour, iberella, and flesh colour; there are some also of a sea-green, others of a sulphur colour, and others white; but there is no necessity for separating the colours and shades to wind them apart, as all the colours are to be before the future scouring and preparing of the silk.

In the philosophical transactions, n° 252, we find the following observations concerning the goodness of silk, which is best distinguished by its lightness. The organice silk is the best made in the country of Piedmont of any; and two threads are equal in fineness, that is, in finarooms, thickness, and length, for the thread of the first twist. For the second, it matters not whether the single thread be strong before the two are joined, unless to see whether the first twist prove well.

It is necessary that the silk be clean; and it is to be observed, that the straw-coloured is generally the lightest, and the white the heaviest of all. The skeins should be even, and all of an equality, which shews that they were wrought together: otherwise we may with justice suspect that it is refuse silk, and cannot be equally drawn out and spun; for one thread will be shorter than the other, which is labour and loss.

Methods of preparing Silks. The several preparations which silks undergo to fit them to be used in the manufacture of silksen, are reeling, spinning, milling, bleaching, and dying. To wind silks from off the balls, two machines are necessary; the one a furnace, with its copper; the other a reel, or frame, to draw the silk. The winder, then, seated near the furnace, throws into the copper of water over the furnace (first heated and boiled to a certain degree, which custom alone can teach) a handful or two of balls, which have been first well purged of all their loose furry substance. She then flits the whole very briskly about with birchen rods, bound and cut like broches; and when the heat and agitation have detached the ends of the silks of the pods, which are apt to catch on the rods, she draws them forth; and joining ten or twelve, or even fourteen of them together, she forms them into threads, according to the bigness required to the works they are designed for; eight ends sufficing for ribbands; and velvets, &c. requiring no less than fourteen. The ends, thus joined into two or three threads, are first passed into the holes of three iron rods, in the fore-part of the reel, then upon the bobbins or pulleys and at last are drawn out to the reel itself, and then fastened each to an end of an arm or branch of the reel. Thus disposed, the winder, giving motion to the reel,
reel, by turning the handle, guides the threads; substitutes new ones, when any of them break, or any of the balls are wound out; strengthens them, where necessary, by adding others; and takes away the balls wound out, or that, having been pierced, are full of water.

In this manner, two persons will spin and reel three pounds of silk in a day; which is done with greater dispatch than is made by the spinning-wheel or distaff. Indeed, all silks cannot be spun and reeled after this manner; either by reason the balls have been perforated by the silk worms themselves; or because they are double, or too weak to bear the water; or because they are coarse, &c. Of all these together, they make a particular kind of silk, called fletta; which being carded, or even spun on the distaff, or the wheel, in the condition it comes from the ball, makes a tolerable silk.

As to the balls, after opening them with scissors, and taking out the insects (which are of some use for the feeding of poultry,) they are steeped three or four days in troughs, the water whereof is changed every day to prevent their thinking. When they are well softened by this scouring, and cleared of that gummy matter the worm had ingluing, and after washing them cut in the river, and drying them lined the inside withal, and which renders it impermeable to the water, and even to air itself, they boil them half an hour in a lye of ashes, very clear and well strained; and after washing them out in the river, and drying them in the sun, they card and spin them on the wheel, &c. and thus make another kind of fletta, somewhat inferior to the former.

As to the spinning and reeling of raw silks off the balls, such as they are brought from Italy and the Levant, the first is chiefly performed on the spinning-wheel; and the latter, either on hand reels, or on reels mounted on machines, which serve to reel several skeins at the same time. See Reel.

As to the milling, they use a mill composed of several pieces, which may mill two or three hundred bobbins at once, and make them into as many skeins.

For the dying of silk, see Dying.

SILPHIUM, in botany, a genus of the compositae. The receptacle is paleaceous; it has no pappus; the calyx consists of three valves; and the radius of the corolla is dimidiated. There are five species, none of them natives of Britain.

SILVER. See Chemistry, p. 79, 130.

SILVERING, the covering of any thing with silver. It is usual to silver metals, wood, paper, &c. which is performed either with fire, oil, or vails. Metal-gilders silver by the fire; painter-gilders all the other ways.

To silver copper or brass: 1. Cleanse the metal with aquafortis, by washing it lightly, and immediately throwing it into fair water; or by heating it red hot, and scouring it with salt and tartar, and fair water, with a small wire-brush. 2. Diffolve some silver in aquafortis, in a broad-bottomed glass vessel, or of glazed earth, then evaporate away the aquafortis over a chaffing-dish of coals. 3. Put five or six times its quantity of water, or as much as will be necessary to dissolve it perfectly, on the remaining dry calx; evaporate this water with the like heat: then put more fresh water, and evaporate again, and, if need be, the third time, making the fire towards the latter end so strong, as to leave the calx perfectly dry, which, if your silver is good, will be of a pure white. 4. Take of this calx, common-salt, crystal of tartar, of each a like quantity or bulk; and mixing well, the whole composition, put the metal into fair water, and take of the said powder with your wet fingers, and rub it well on, till you find every little cavity of the metal sufficiently silvered over. 5. If you would have it richly done, you must rub on more of the powder; and in the last place wash the silvered metal in fair water, and rub it hard with a dry cloth.

SILVERING of Glasses. See Foliating of Looking-glasses.

SIMIA, the Monkey, in zoology, a genus of quadrupeds belonging to the order of primates. They have four fore-teeth in each jaw, placed near each other; the dog-teeth are solitary, and remote; and the grinders are obtuse. There are 23 species: Of these, three, viz. the satyrus, sylvanus, and inuus, have no tail. Other three of them, viz. the nemestrina, apidea, and sphinx, have short tails. The other 27 have long tails. The specific distinctions are taken from the colour, and other circumstances.—The monkey-kind are remarkable for activity, a low species of cunning, and a facility of imitating the actions of men and other animals. The sagacity and docility of the simia are so well known that it is needless to spend time in giving instances of either.

SIMILE. or SIMILITUDE, in rhetoric, a comparison of two things, which though different in other respects, yet agree in one. The difference between a simile and comparison, is said to consist in this, that the simile properly belongs to whatever we call the quality of the thing, and the comparison to the quantity.

SIMONICAL, is applied to any person guilty of simony. See Simony.

SIMONIANS, in church-history, a sect of ancient heretics, so called from their founder Simon Magus the magician. The heretics of Simon Magus were principally his pretending to be the great power of God, and thinking that the gifts of the Holy Ghost were venal, and to be purchased with money. He is said to have invented the Eons, which were so many persons of whom the Godhead was composed. His concubine Helen, he called the first intelligence, and mother of all things; and sometimes he called her Minerva, and himself Jupiter. Simon Magus gained a great many prolesytes, who paid himself and his concubine divine worship; these were the earliest heretics, and those that St John, St Peter, and St Paul, in their epistles, so often warn the Christians against.

SIMONY, in ecclesiastical law, the crime of buying or selling spiritual gifts or preferments. In the ancient Christian church, this crime was always thought to be committed when men either offered or received money for ordinations. The apostolical canons lay a double punishment both of deposition and excommunication on such of the clergy as were found guilty of it. This was the first fort of simony, and that which was most properly so called; and to this the ancient reduced the exacting of any reward for administering the eucharist or baptism, or for any spiritual offices. A second fort of simony consisted in buying the spiritual preferments of the church: this was punished with deposition in any bishop, who promoted any church-officer for the sake of lucre; and the persons so promoted were to be degraded from their office. By the laws of Julianus, every elector was to deposit
pose upon oath, that he did not chuse the person elected for any gift or promise, or friendship, or any other cause, but only because he knew him to be a man of the true catholic faith, of unblameable life, and good learning. This last form of simony was, when men, by ambitious arts and undue practices, got themselves invested in an office or preferment to which they had no regular call, or when they intruded themselves into other mens places which were legally filled before. The caufiis for the church of Rome maintain, that all compacts or bargains in which benefices are concerned, are simoniacal, when it is done without the pope’s concurrence; but that, once obtained, gives a function to the thing; which they found upon this universal proposition, that the pope cannot commit simony in beneficiary matters, since he hath a power so absolute over all the ecclesiastical goods and benefices, that he can unite, divide, and bestow them in whatever manner he pleaseth.

Against the corruption of simony, there have been many canons made in our own church, which punish the offender with deprivation, disability, &c. and by a statute of the 31 Eliz. it is enacted, that if any person, for any sum of money, reward, gift, profit, or benefit, or by reason of any promise, agreement, grant, bond, covenant, or other assurance, shall present, or collate any person to any benefice with cure, dignity, or living ecclesiastical, every such presentation, or collation, and every admission or induction thereupon, shall be utterly void, and the crown shall present for that sum; and the person that shall give or take any sum of money, &c. shall forfeit double the value of one year’s profit of any such benefice; and the person so corruptly taking any such benefit, shall from henceforth be disabled to have and enjoy the same.

SIMPLE, something not mixed or compounded; in which fene, it stands opposed to compound. SIMPLÉ, in pharmacy, a general name given to all herbs or plants, as having each its particular virtue, whereby it becomes a simple remedy. SIN, a breach or transgression of some divine law, or command.

SINGULAR number, in grammar. See Grammar.

SINGULAR, something on, or towards the left-hand; sinister is also used among us for unlucky, though in the sacred rites of divination the Romans frequently used it in an opposite sense. SINNER, in heraldry. The sinister side of an escutcheon is the left-hand side; the sinister chief, the left angle of the chief; the sinister base, the left-hand part of the base.

SINGULARITY, a series of bends and turns in arches, or other parts of a building. SINGING, the action of making divers inflections of the voice, agreeable to the ear, and correspondent to the notes of a song, or piece of melody.

SINGING, the action of making divers inflections of the voice, agreeable to the ear, and correspondent to the notes of a song, or piece of melody.

SINE, or right Sine of an arc, is a right line drawn from one end of that arch, perpendicular to the radius drawn to the other end of the arch; being always equal to half the chord of twice the arch. See Trigonometry, and Geometry.

SINUS, in anatomy, denotes a cavity of certain bones, and of a very audere adstringent taste, and ferments very slowly in the mouth, and is perfectly fine and smooth to the touch, does not crumble easily between the fingers, and stains the hands. It melts easily between the fingers, and stains the hands. It melts readily, and is of a pure texture, but not very hard, and of an even, but dully surface. It adheres firmly to the tongue, is perfectly fine and smooth to the touch, does not crumble easily between the fingers, and stains the hands. It melts very slowly in the mouth, and is perfectly pure and fine, and of a very buller astringent taste, and ferments very violently with aqua-fortis. It was dug in Cappadocia, and carried for sale to the city Sinope, whence it had its name. It is now found in plenty in the New-Jerseys in America, and is called by the people there blood-stone. Its fine texture and body, with its high florid colour, must make it very valuable to painters, and its powerful astringency equally fo in medicine.

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SINOPICA TERRA, in natural history, the name of a red earth of the ochre-kind, called also rubrica sinopica, and by some authors sinopis. It is a very close, compact, and weighty earth, of a fine glowing purple colour. It is of a pure texture, but not very hard, and of an even, but dully surface. It adheres firmly to the tongue, is perfectly fine and smooth to the touch, does not crumble easily between the fingers, and stains the hands. It melts very slowly in the mouth, and is perfectly pure and fine, and of a very buller astringent taste, and ferments very violently with aqua-fortis. It was dug in Cappadocia, and carried for sale to the city Sinope, whence it had its name. It is now found in plenty in the New-Jerseys in America, and is called by the people there blood-stone. Its fine texture and body, with its high florid colour, must make it very valuable to painters, and its powerful astringency equally so in medicine.

SINOSITY, a series of bends and turns in arches, or other irregular figures, sometimes jutting out, and sometimes falling in.

SINUS, in anatomy, denotes a cavity of certain bones, and other parts, the entrance whereof is narrow, and the bottom wider and more spacious.

SINUS,
SINUS, in surgery, a little cavity, or sacculus, frequently formed by a wound or ulcer, wherein pus is collected.
SION, a town of Switzerland, in the county of Valais, situated on the river Rhone, twenty-three miles south-east of the lake of Geneva, being a sovereign state.
SIPHON, a bended pipe, one end of which being put into a vessel of liquor, and the other hanging out of the said vessel over another, the liquor will run out from the first into the last, after the air has been sucked out of the external or lower end of the siphon, and that as long as the liquor in the upper vessel is above the upper orifice of the siphon.
SIPHONANTHUS, a genus of the tetrandria monogynia class. The corolla consists of one funnel-shaped petal, with eight segments; and there are two berries containing many seeds. There is but one species, a native of India.
SIRONAGER, a city of bither India, capital of the province of Siba, situated on the river Ganges: E. long. 80°, N. lat. 31° 30′.
SIRE, a title of honor in France, now given to the king only, as a mark of sovereignty.
SIREN, in antiquity, a kind of fabulous animal, otherwise called a mermaid.
The sirens are represented by Ovid, &c. as sea-monsters, with women's faces and fishes' tail; and by others decked with plumage of various colours. The three sirens are supposed to be the three daughters of the river Achelous; and are called Parthenope, Ligea, and Leucotha. Homer makes mention of only two sirens, and some others reckon five. Virgil places them on rocks with women's faces and fishes' tail; and by others furnished with plumage of various colours. The sirens are represented by scaly monsters, with a long fish's tail, which sailors were wrecked on their rocks without regret, and even expired in raptures.
SIREN, in antiquity, a kind of fabulous animal, otherwise called a mermaid.
SISHER, in zoology, a genus belonging to the order of amphiibia mcanes. See Astronomy, p. 487.
SISON, in botany, a genus of the pentandria digynia class. The fruit is oval and striated; and the involucrum consists of many leaves; and the petals are heart-shaped. There are 8 species, three of them natives of Britain, viz. the latifolium, or great water-parnise; the nodiflorum, or creeping water-parnise; and the ericulm, or upright water-parnise.
SIXTH, in music, one of the simple original concords, or harmonical intervals. See Music.
SIZE, the name of an instrument used for finding the bigness of fine round pearls. It consists of thin pieces or leaves, about two inches long and half an inch broad, fastened together at one end by a rivet. In each of these are round holes drilled of different diameters. Those in the first leaf serve for measuring pearls from half a grain to seven grains; those of the second, for pearls from eight grains, or two carats, to five carats, &c. and those of the third, for pearls from six carats and a half to eight carats and a half.
SIZE is also a sort of paint, varnish, or glue, used by painters, &c.
The shreds and parings of leather, parchment, or vellum, being boiled in water and strained, make size. This substance is used in many trades.
SIT, in alchemy, a bright star in the constellation Cancer. See Astronomy, p. 487.
SITTA, in ornithology, a genus belonging to the order of Passerine mcanes. This star is also a sort of paint, varnish, or glue, used by painters, &c.
SITOPHYLAX, in Grecian antiquity, an Athenian magistrate, who had the superintendence of the corn, and was to take care that nobody bought more than was necessary for the provision of his family.
SIUM, in botany, a genus of the pentandria digynia class. The fruit is somewhat oval, and striated; the involucrum consists of many leaves; and the petals are heart-shaped. There are 8 species, three of them natives of Britain, viz. the latifolium, or great water-parnise; the nodiflorum, or creeping water-parnise; and the ericulm, or upright water-parnise.
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SIT is also a sort of paint, varnish, or glue, used by painters, &c.
The shreds and parings of leather, parchment, or vellum, being boiled in water and strained, make size. This substance is used in many trades.
The manner of using size is to melt some of it over a gentle fire; and scraping as much whitin into it as may only colour it, let them be well incorporated together; after which you may whiten frames, &c. with it. After it dries, melt the size again, and put more whitin, and whiten the frames, &c. seven or eight times, letting it dry between each time: but before it is quite dry, between each walking, you must smooth and wet it over with a clean brush-pencil in fair water.
To make gold-size, take gum animi and alphasium, of each one ounce; cinchonamine, of one ounce; litharge of gold, and amber, of each half an ounce; reduce all into a very fine powder, and add to them four ounces of linseed-oil, and eight ounces of drying-oil; digest them over a gentle fire that does not flame, so that the mixture may only simmer, but not boil; for fear it should run over and let the house afire, keep it Constantly stirring with a stick till all the ingredients are dissolved and incorporated, and do not leave off stirring till it becomes thick andropy; and being boiled enough, let it stand till it is almost cold, and then strain it through a coarse linen-cloth and keep it for use.
To prepare it for working, put what quantity you may have occasion to use in a horse-muscle shell, adding so much oil of turpentine as will dissolve it; and making it as thin as the bottom of your feed-lac varnish, hold it over a candle, and then strain it through a linen rag into another shell; add to these so much vermilion as will make
SLAB, an outsid flirt plank or board fawed off from the SKIRPTON, a town in the west riding of Yorkshire, situated thirty five miles west of York.

SKIRMISH, in war, a disorderly kind of combat, or en- counter, in presence of two armies, between small parties, or persons, who advance from the body for that purpose, and introduce to a general and regular fight.

SKIFF, the lead of two ship-boats, serving chiefly to go ashore in, when the ship is in harbour.

SKIN, in commerce, is particularly used for the membrane stripped off the animal to be prepared by the tanner, Skinner, currier, parchment-maker, &c. and converted into leather, &c. See TANNING, &c.

Skins and the hair of beasts manufactured become parchment and vellum; leather, of which are made shoes and boots, saddles, harnesses, and furniture for horses, gloves and garments, coaches and chairs, household stuff, covers of books, drinking vessels, &c. and furrs for clothing, hats, caps, &c.

SKINNER, one who works in skins. See SKIN.

SKIPTON, a town in the west riding of Yorkshire, situated thirty five miles west of York.

SKY, the blue expanse of air and atmosphere. The azure colour of the sky Sir Isaac Newton attributes to vapours beginning to condense there, and which have got confluence enough to reflect the most refractive rays.

SLAB, an outside fappy plank or board fawed off from the sides of a timber-tree: the word is also used for a flat piece of marble.

SLATE, a flone of a compact texture and laminated structure, splitting into fine plates.

Dr Hill distinguishes four species of flate ftagenium: 1. The whitish ftagenium, being a sort, friable, flaty flone, of a tolerably fine and close texture, considerably heavy, perfectly dull and dullfite of brightnefs, variegated with a pale brown, or brownifh yellow: this species is very common in many counties in England, lying near the surface of the ground; it is generally very full of perpendicular as well as horizontal cavities, many of which are filled up with a spar a little purer and more crystalline than the rest, and is commonly used for covering houses. 2. The red ftagenium is a very fine and elegant flate, of a smooth surface, firm and compact texture, considerably heavy, and of a very beautiful pale purple, glittering all over with small glossy spangles: it is com- posed of a multitude of very thin plates or flakes, laid closely and evenly over one another, and cohering pretty firmly: this is very common in the northern parts of England, and is much valued as a strong and beautiful covering for houses. 3. The common blue ftagenium is very well known, as an useful and valuable flone, of a fine smooth texture and glossy surface, moderately heavy, and of a pale greyifh blue: composed of a multitude of even plates, laid close upon one another, and easily splitting at the commiffures of them: this is also very common in the north parts of England, and is used in most places for the covering of houses. There are other species of this flate, viz. The brownifh blue friable ftagenium, usually called coal flate; the greyifh black friable ftagenium, commonly called fliver; and the greyifh blue sparkling flage-nium. 4. The friable, aluminous, black ftagenium, being the Irish flate of the flips: this is composed of a multitude of thin flakes, laid very evenly and regularly over one another, and splits very readily at the commiffures of them. It is common in many parts of Ireland, and is found in some places in England, always lying near the surface in very thick strata. In medicine, it is used in haemorrhages of all kinds with success, and is taken often as a good medicine in fevers.

There is a sort of flate-flones called, by Dr Hill, ammonchifta. Of this kind there are only two species: 1. That composed only of sparay and crystalline particles; or the grey, friable, dull ammonchiftum; being a coarse, harsh, and rough flone, of a very loose texture, considerably heavy; and composed of a large, coarse, obtuse-angled grit, surrouned, and in part held together, by a loose earthy spar. This flone is very common in moist countries, and is frequently used to cover houses, instead of tiles: it bears the weather but badly, and is apt to crumble after frosts. 2. That composed of taly, sparay, and crystalline particles. This comprehends five species, viz. the brownifh white glittering ammonchiftum; the greenifh grey shining ammonchiftum; the yellowifh grey glittering ammonchiftum; the hard purple and white laminated ammonchiftum; and the bluish glittering flate flone. These sorts of flate-flone are very common in the northern countries, and are used in covering houses, paving, building, &c.

SLAVE, a perfon in the absolute power of a master, either by war or conquest. We find no mention of slaves before the deluge; but immediately after, viz. in the curfe of Canaan: whence it is easily inferred, that servitude increased soon after that time; for in Abraham's time we find it generally established.

Among the Romans, when a slave was set at liberty, he changed his name into a surname, and took the name or prenomen of his master; to which he added the cognomen he had been called by when a slave. Great part of the Roman wealth consisted in slaves: they had the power of life and death over them, which no other nation had; but this severity was afterwards moderated by the laws of the emperors. The slaves were esteemed the proper goods of their masters, and all they got belonged to them; but if the master was too cruel in his correction, he was obliged to sell his slave at a moderate price.

Slavery is absolutely abolished in Britain and France, as to personal servitude. Slaves make a considerable article.
SLING, an instrument serving for casting stones with great power.

SLEDGE, a kind of carriage without wheels, for the conveyance of very weighty things, as huge stones, &c.

SLEEP, is defined to be that state wherein the body appearing perfectly at rest, external objects move the organs of sense as usual, without exciting the usual sensations.

Sleep is broken off unnaturally, when any of the organs of sensation is so briskly acted on, that the action is propagated to the brain.

Sleeping being one of the non-naturals, it is not possible for thoes to preserve their health, who do not go to sleep in a regular manner: for sleep repairs the spirits, which are dissipated by watching; and consequently it restores the strength of those who are weak, indifposed, or labour much. It likewise promotes perspiration, contributes greatly to digestion, and more to nutrition. The night is the most proper for sleep; for the vigour of the mind and body are better restored in the night than in the day; thus nocturnal labour and lucubrations impair the health.

SLEEPER, or the great sleeper, in zoology. See Bradypus.

SLIGO, a county of Ireland, in the province of Connaught, bounded by the ocean on the north, by Lettrim on the east, by Roscommon on the south, and by Mayo on the west.

SLING, an instrument serving for casting stones with great violence. The inhabitants of the Balearic islands were famous in antiquity for the dexterous management of the fling: it is said they bore three kinds of flings, some longer, others shorter, which they used according as their enemies were either nearer or more remote. It is added, that the first served them for a head-band, the second for a girdle, and that a third they constantly carried with them in the hand.

SLIPPING, among gardeners, the tearing off a sprig from a branch, or a branch from an arm of the tree. These sorts of slips take root more readily than cuttings.

SLOANEIA, in botany, a genus of the polyandria monogyria class. The corolla consists of five petals, and the calyx of five deciduous leaves; the stigma is perforated; and the berry contains many seeds.

SLOATH, in zoology. See Bradypus.

SLOE. See Prunus.

SMALLAGE, in botany. See Apium.

SMALLLAND, a province in Sweden, in the territory of Smaland, in the Swedish dominions, according to the duchy of Lithuania and kingdom of Poland: situated in E. long 27°, and N. lat. 53°.

SMALLING, among gardeners, the tearing off a sprig from a branch, or a branch from an arm of the tree. These sorts of slips take root more readily than cuttings.

SMALAND, a province in Sweden, in the territory of Småland, a port-town of Dutch Flanders, situated opposite to the island of Cadant: E. long 3° 15', N. lat. 51° 18'.

SMALT, a preparation of arsenic. See Chemistry, p. 145.

SMALLISH, a port-town of Dutch Flanders, situated opposite to the island of Cadant: E. long 3° 15', N. lat. 51° 18'.

SMALLS, a preparation of arsenic. See Chemistry, p. 145.

SMARRAGDUS, in natural history. See Emerald.

SMARIDUS, a natural history. See Emerald.

SMASH, with regard to the organ, is an impression made on the nose, by little particles continually exhalimg from odorous bodies: with regard to the object, it is the figure and disposition of odorous effluvia, which striking on the organ, excite the sense of smelling: and with regard to the soul, it is the perception of the impression of the object on the organ, or the affection in the soul resulting therefrom.

The principal organs of smelling are the nostrils, and the olfactory nerves; the minute ramifications of which latter are described throughout the whole concave of the former. See Anatomy, p. 293.

SMELTING, in ichthyology, a species of Salmo. See Salmo.

SMELTING, in metallurgy, the fusion or melting of the ores of metals, in order to separate the metallic part from the earth: it is also used to purify metals, by the action of heat.
SMOKE, a dense elastic vapour, arising from burning bodies.

SMITHERY, a manual art, by which an irregular lump of iron is wrought into any intended shape, by means of fire, hammering, filing, &c.

SMOKE, a dense elastic vapour, arising from burning bodies. As this vapour is extremely disagreeable to the inhabitants of Britain, we have been sufficiently demonstrated, that, like other fluids, it has a constant tendency to preserve an equilibrium in all its parts; so that, if at any time the weight of it at one place is diminished, the heavier air rushes from all sides towards that point, till the equilibrium be again restored. We there like wise saw, that heat was one of the most powerful means of disturbing this general equilibrium of the air, by expanding it to a great degree, and making the same quantity occupy a much greater space than before, and consequently become lighter. Hence it necessarily follows, that wherever a fire is kindled, the air immediately contiguous to it will be heated, and of consequence rarified and made light; which must ascend into the higher regions of the atmosphere, till it becomes of the same gravity with the air contiguous to it, while the denser cold air below rushes toward the point from which it departed, is there heated and rarified in its turn, and ascends in the same manner, carrying the smoke or vapour arising from the burning body along with it. In this manner that constant motion of air towards every fire is produced, and from this cause proceeds the constant tendency of smoke to ascend upwards from the surface of the earth.

But as the body of our atmosphere is often agitated with wind, &c. and as it is an elastic fluid, it endeavour to spread itself every way; from which causes the warm air would quickly be diffused among the cold air before it could arise to any considerable height; so that the smoke would always remain low, and be tied about near the surface of the earth; all of which inconveniences are avoided by confining this heated air in a tube, which prevents it from mixing with the external air, till it arrives at the height to which we desire it should ascend.

To render this still more clear, see Plate CLVI. where AB (fig. 1.) represents the tube of a chimney, having a fire at the bottom at A. It is obvious, that, in this situation, the air which was heated by the fire at A, will ascend directly upwards, without mixing with the external air, till it arrives at B, beyond which it will be at liberty to diffuse in the atmosphere; and the more weighty air which profits in to supply its place can have no access to it but at the opening between A and E, where it also is heated by the fire, and in its turn ascends to the top of the chimney, thereby occasioning a conflant stream of air to ascend up the chimney, which carries the smoke along with it. This is the manner in which fuliginous vapours are made to ascend in chimneys; and by attending to it, we may draw the following corollaries with regard to the construction of this useful part of our habitations.

If, the higher the chimney, that is, the greater the distance between the fire-place and the top of the chimney, the greater will be the difference between the weight of the column of heated air in the tube, and another column of the atmosphere of the same diameter without the chimney, and consequently the air will enter with the greater force at the opening AE, and carry up the smoke more readily along with it: for as the warm air within the tube continues rarified to a high degree till it issues from the top of the chimney, and is, in every part of its length, lighter than the same bulk of external air marked by the dotted line CD, it follows, that the longer these two columns of unequal gravity are, the greater must be the difference of their weight. Hence it is, that high chimneys (elevated paribus) have a greater fiction of air, and are less liable to vent ill, than low ones. A smoky chimney may therefore sometimes be cured by raising it higher. It is likewise obvious, that if any opening is made into the chimney, as at F, the air will enter with less force at E, and carry up the smoke with less velocity, and by that means be in danger of producing smoke in the room; for this opening, as it admits the fresh air into the tube, has nearly the same effect as shortening the tube so much would have.

2d, As the smoke is forced up the chimney merely by the rarefaction
rarefaction of the air in consequence of heat, it is evident,
that the more the air is heated, with the greater force (ce-
teris paribus) will it ascend, because the difference between
the weight of the external and internal air will be great-
er; and as the air will be the more heated the nearer it is made
to pass by the fire in its entry into the chimney, it is evi-
dent, that the smaller the opening at AE is, or, in other words,
the lower the mantle of the chimney is, the air will be for-
ced to pass the nearer the fire, and therefore be more rarefied,
and ascend with the greater velocity; so that lowering the
mantle of the chimney will often cure smoke.

But it is frequently inconvenient to have the mantle of
the chimney too low. However, the same effect may often
be produced by another contrivance. For as the fire-place is
usually made wider than the length of the grate, a great
deal of cool air paffes at the two fides of the grate without
being much heated. This greatly diminishes the lucction of
the chimney: but it may easily be prevented by building up the
vacancies at each fide of the grate, so as to allow no air to
enter from below, except what comes immediately through,
or before the fire. For this purpose, grates confiding of a
sheet of milled iron within the mantle as in fig. 2. This ftruc-
ture allows a quantity of cool air to enter at the two corners of the
mantle, and fteal up the tube without coming near the fire.
The molft cally and eftual method of remedying this defect, is
to place a sheet of milled iron within the mantle on each
fide, as low down as poffible, making them flant a little up
wards towards the middle of the chimney; as in fig. 2. The
mantle being represented by the dotted line. By this con-
trivance, the air, which enters at the fide of the mantle,
before it can ascend into the chimney, is forced to pafs very
near the fire, and of course is much rarefied. The good ef-
efts of this would be still more strongly felt, if one of thefe
plates were placed a little lower than the other, and made fo
long, that the ends should cross each other, as at AB, fig. 2,
by which means every particle of air that went up the chim-
ney behaved to pafs immediately above the fire. It is al-
mot unnecessary to obferve, that these plates ought to be fo
contrived as to be taken out at pleasure to allow the chimney
to be cleaned.

A chimney may not only be defective by having the man-
tle too high, or by being too wide from fide to fide, but afo
by being too deep between the fore fide and the back, as is
often the cafe in very old houses. In this cafe, the diftance
between the fire and the mantle is fo great, that much air
paffes up without being sufficiently rarefied, as is represented
at fig. 3. This may be fometimes cured by bringing
the grate a little forward, which, by making the fire aft more
powerfully upon the mantle, rarefies the air more in its
paffage. But this can seldom produce the defired efpect,
and it often does harm: for when the grate is brought for-
ward, there is a great vacancy left between it and the back
of the chimney, fo that the air paffes under the grate, and
ascends behind it very little rarefied; so that, if the feet of
grate are not very low, there will be as much loft in this
way as will be gained in the other; and as there is not enough
of heated air in the chimneys of this kind to make the va-
pour ascend with rapidity, they are often choked with
thick fuliginous vapours hanging in them, almost in equili-
bro with the ref of the atmosphere, fo that the leaff puff
of wind beats them down the chimney, and pushes the
smoke into the room; whereas, when it is far back, it is dri-
ven down upon the hearth, and rises upwards again when
the gulf is over, and a great deal of it is catched within the
mantle as it rifies, which in the other cafe would have been
difpered through the room. When this is the cafe, the
most eftual method of cure is, to bring the grate forward
till the forepart of it is immediately under the inner edge of
the mantle; then build up the vacancy at the back of it, the
whole width of the fire-place from fide to fide, raiing it per-
pendicular till it is as high as the back of the grate, and
then bending it forward towards the mantle, as is repre-
sented at fig. 4. When it is as high as the workman can
reach, let it be suddenly turned backward again, floping a
little upward, as in the figure; then fit a fheet of milled
iron to the inside of the mantle, making it flant a little up-
ward toward the back part, at a small distance above the
new erected mafonry, and extend it within a few inches of
the back wall, as at A, fig. 4. By this conftruction all the
air that enters into the chimney is made to pafs immediately
above the fire, between it and the heated iron, upon which
the flame acts with the greater force, as the back of the
fire-place is bent a little forward above the grate, and
the heat is likewise reflected into the room with the
greater force: at the fame time, if the smoke is at any time
beat down the chimney by a fudden gulf of wind, it will be
catched by the fheet of iron, and prevented from coming into
the room. If the fire-place be very wide between the
the one fide and the other, the new mafonry may be carried
quite up to the fheet of iron on each of the tides.

3d. As every fire requires a conflant fucceffion of fresh
air, the tube for conveying this rarefied air to the higher
regions of the atmosphere must be of a fufficient fize to
contain the whole of it, and allow it a ready paffage; other-
wise a part of it will be forced to fekke fome other paffage;
by which means, the apartment in which the fire is placed
will be conflantly filled with fmoke. Every chimney there-
fore ought to have a degree of widenefs fufficient to carry
off the whole of the fmoke arifing from the fire usually
burnt in it, otherwife the apartment will be almoft continually
filled with fmoke. This is a fault more common at pre-
rent than any of thofe already mentioned, efpecially in large
towns, where the number of chimneys in one wall is often fo
great that it is difficult to get a fufficient fpace for each. The
moft obvous cure, where the situation admits of it, is to widen
the chimney, by opening a hole a little above the grate thro'
the back-wall of the chimney, flanting a little upward, and
building on the outside of the wall a small chimney open from
that hole to the top of the building, as in fig. 5, where AB
represents the new tube going through the wall at the opening
at A, which will receive the fuperfluous fmoke, and carry it
off. This additional chimney muft always be carried as high
as the other. But as there are many situations in which
this method of cure would be impracticable, we muft try er-
every method for accelerating the afeent of the fmoke; (for
the more quickly it afeends, the more narrow may the tube
be,) and with that view, the chimney may be heightened at
top, and contracled at bottom, in any or all the various
ways we have mentioned. But if none of thofe methods
prove eftual, let the chimney be built quite clofe at the
under part, leaving only as much room as is fufficient to
contain the grate, having a cover of metal fitted to that o-
pening, which can be taken off or put on at pleasure; by
which the whole air that enters into the chimney is made to
pafs through the fire like a furnace, and carries the fmoke
up it with great velocity. These are well known in large
towns by the name /make-chimneys/: but as they occasion a
prodigious waft of fuel without warming the room, and,
unless attended with very great care, are in danger of fet-
ting the building on fire, they ought to be as much avoided
as possible. But if neither this, nor any of the other meth-
ods prove effectual, the wall muft either be taken down
and rebuilt in a proper manner, or the chimney abandoned
as incurable. As this is a defect more difficult to be reme-
died than any other, we would strongly recommend it to every
builder to build his chimneys of a sufficient width through-
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builder to build his chimneys of a sufficient width through-

4th. As the air which ascends through the chimney con-
tinues nearly of an equal degree of heat to the top, the
tube should be of an equal degree of width at the top as at
the bottom, as well as through the whole of its length.
It ought not therefore to be made tapering gradually from
the fire-place to the top, but to be suddenly contracted a-
bove the grate, as in fig. 6. from which it ought to be con-
tinued of an equal wideness throughout its whole length:
but if it is narrower at any one place than another, it ought
to be at the under part, immediately above the fire, for a
very short space; because, as this is within reach of the hand,
the foot can be cleaned from it as often as is necessary. So
that if the other parts of the chimney are full and
clogged with soot, they will not be narrower than this place
is at that time.

5th. It seldom happens that a chimney can be carried
quite straight upwards; and it is an advantage that it is so,
as they ought always to be bent a little. For if a chimney
be straight, and of a proper width to transmit the whole of
the smoke and no more, it will not be sufficient for that
purpose, when there is a heavy fall of rain, or snow, or
hail, with little wind; for the great drops will fall perpen-
dicularly from the top to the bottom of the chimney, and
as they occupy a considerable space, the smoke will not
have room to ascend, but must be forced down with the
flower, and dispersed in the apartment: whereas, if the chim-
ney is bent, the rain falls upon some of the sides, and slides
gently down without disturbing the ascent of the fmoke.
The fame inconvenience will be felt in a straight chimney,
where it is so placed as to be exposed to winds which
sometimes enter the top and blow down with a sudden puff:
for, if it be straight, the air meets with no interruption till
it descends into the chamber, and there disperses the fmoke;
but if it be crooked, the defcent of the wind will be ob-
structed its force broken, and the bad effects of it in a
great measure prevented. Upon the whole, bent chimneys
are always preferable to straight ones. However, a perpen-
dicularly chimney may be easily cured, by some of the con-
trivances after mentioned.

There are the most general defects arising from the struc-
ture of the chimney itself, which are all reducible to the
following cauies: 1. Too little height; 2. Too great
widenss of the bottom of the chimney; 3. Too little
width; 4. Unequal widenss between the top and bottom;
and, 5. Straightness of the tube. We have pointed out
the bell methods of curing each of these defects; and to fi-
and the air in it become as light as the external air at the through the outer wall of the houle, and communicates with pradiled, doors and windows might with fafety be made may occafion fmoke when the wind is in certain diredions.

the prefent mode of conftruding chambers, is kept alive by current of air will occafion a fort of fudion at the opening small hole made in the wall at the hack of the chimney, As the Imoke is impelled up the chimney by the prefiure its Tull widnefs when neceffary, or clofe it to any degree at so that the air within would be Toon u'artned, and continue turned about.

The wire might be fixed to a small brafs-handle moving freely upward and downward like a conftant fupply of air would be adminirered to the fire with- out the smallest inconvenience or trouble. If this were pracitifed, doors and windows might with safety be made much clofer than at prefent, and our apartments rendered equally warm and comfortable with a much smaller quan- tity of fuel than we ufe at prefent. For as the fire, in the prefent mode of conftruding chambers, is kept alive by a conftant fuccceffion of cold air from the doors, windows, and other crannies of the room rushing towards the chimney in all directions, the air of the room, which, if not cooled by this means, would be quickly heated to a great degree, is constantly kept cold in spite of the strong heat of a blazing fire; which, at the fame time that it scorches the parts of our body which are most expofed to it, does not warm the parts which are turned from it; and we experience at the fame time a burning heat and piercing cold, which is often productive of the moft difagreeable effects. But if the fire were supplied with air in the manner abovementioned, there would be lefs air drawn in through the crannies of the room, so that the air within would be soon warmed, and continue long fo even with a small degree of heat. However improper this might be for people in perfect health, it might sure- ly be of great ufe for thofe who are in a weakly habit of body; efpecially if care were taken to carry off the foul air, by having a small tube leading from the upper part of the room to the top of the houfe, through which the air which had been rendered noxious by the smoke of candles or per- spiration would be conveyed away, and a fuccedion of fresh air admitted from the tube near the fire-place to supply that want. That the reader may more readily comprehend what is here meant, we have repreffented in fig. 6, a view of two small tubes for this purpofe suppofed to be laid open by tak- ing away the boxing or inner coating of the wall which ought to cover them. Thes are of wood, and muft not be above one inch in diameter. One end, g g, goes quite through the outer wall of the houfe, and communicates with the open air, having a small grate upon it to prevent vermin from entering. The other end, b b, paffes behind the two flabs at the side of the fire-place, and open in the inside of the fire-place at i i, at which place they have each of them a small bit of brafs fitted to them, being clofed with two fild- doors exactly like thofe that are ufed to cover the end of telescopes, by means of which more or lefs air may be admitted at pleasure.

20, A second caufe of smoke, is the wrong poition of doors and windows, with refpect to the fire-places.

As the smoke is impelled up the chimney by the prefiure of the air, if that air is driven away from the fire-place by any caufe more powerful than the fudion occafioned by the fire, the smoke muft also be drawn away with it, and follow the fame direftions with that current of air; so that whatever tends to draw a current of air from the under part of the chimney, will also tend to produce smoke in the houfe; from whence it is easy to conceive how doors or windows may occasion smoke when the wind is in certain direftions.

Thus, fuppofe a chamber, A, B, C, D, fig. 9. having a door or window at E, another at F, and a fire-place at G; when the wind is in the direftion D A or C B, the general current of air will occafion a fort of fudion at the opening E, fo that the air will be drawn from the chimney G to- wards E; and if the current be ftrong, and the opening at E large, it will become more powerful than the fudion of the chimney, and produce smoke in the apartment. If the window at F should be opened in this cafe, it would not mend the matter; for any wind which fhould enter at F, would be carried freight out at the opening E, and the cur- rent of air would be drawn from the chimney as Strong as ever. If the window at E were fhut, and that at F left open, and the wind ftil! continued in the fame direftion as before, the current of air running pulf the window would have a tendency to draw the air of the room along with it, and

* If any one fhou'd think, that the wire d would be a difagreeable object in the middle of a chimney-piece, it might easily be hid by a picture of any kind. The wire might be fixed to a small brafs-handle moving freely upward and downward like that for a bell; only this should have a long fit in the middle of it, with notches on each fide, to receive a pin placed in the middle of the fit, by means of which the wire might be lengthened or shortened at pleasure. The whole of this apparatus is re- preffented at fig. 16, where (a) represents the wire fitten to the brafs-plate; (b) a piece of brafs, railed a little, to ferve as a handle. The fit in the middle is repreffented by the dark line, having notches very convenient distances. The pin d is fixed into the wall, but left at liberty to turn about with cafe; and its head stands up a little, fo as to be easily turned with the finger and thumb. The body of this nail is made fo thin in one direftion, that when it is turned half round, it eafily paffes through the fit in the plate; but in the other direftion its diameter is greater, fo that when the plate is brought to as to have one of the notches oppofite to the nail, and it is then turned half round, it catches the plate fo that it cannot be moved till the nail is again turned about.
and occasion smoke, but not so powerfully as if the window at E were open; but if the wind were in the direction D B, it would be very bad: but if it blew in the direction C A, the cafe would be very much altered; for then a quantity of air being forced in at the opening F, and finding no ready passage, it would be pent up in the chamber, and force itself up the chimney with violence. We omit mentioning what would be the effect if the wind were in other directions, as it is imagined there will be sufficiently obvious to every attentive observer...It is only necessary here to observe, that as doors or windows are seldom so exactly made, but they produce some effect, as they always admit some air even when shut, and often occasion smoke when the wind blows from a particular quarter; and as workmen and others generally apprehend, when houses are troubled with smoke in this manner, that it is occasioned by some external cause, and apply their attention to cure it by altering the top of the chimney, which never can produce the smallest service in this case; we would recommend a more particular attention to be paid to the situation of doors and windows than is generally bestowed, especially in such situations where they are exposed to any violent current of air in a particular direction, as in narrow lanes, or defiles of any sort, where the wind, when in particular directions, is hurried along with a prodigious rapidity. And, that the effects of different positions may be still more obvious, we shall produce several other examples.

Suppose a chamber, fig. 9, having a door at A, and two windows B C, with a fire-place D. If the wind came in the direction DA, and if the door tranmitted as much or more air than was admitted at both the windows, a current of air would run from all parts of the chamber towards A, and therefore would have a tendency to occasion smoke; but if as much or more air came in at the windows than could get out at the door, there could be no such current; but, on the contrary, it would be forced up the chimney, and carry the smoke along with it: wherefore in this situation, a room might sometimes be cured of smoke, by making the door as close as possible; nothing could be more hurtful in this case than boring a hole in the door. But if the house was in such a situation as to be more frequently exposed to a wind which came in the direction of AD, it would run little risk of being troubled with smoke.

Suppose a room, fig. 10, having a door at A, and two windows B and C, with a fire-place D. If the wind came in the direction CB or BC, and both the windows were open, it is evident that the smoke would be drawn from the chimney by the strong current of air passing through the room; or if the window upon which the wind came were closed, and the opposite one open, nearly the same effect would be produced: but if the window upon which the wind blew were open, and the opposite one and the door shut, the room would be immediately cleared of smoke entirely. In this situation, it is evident, that if the windows were badly made, so as to admit much air, it would tend to occasion smoke, especially if the door were in the same situation; it is therefore of consequence to attend to this circumstance in a situation similar to this.

Having premised so much with regard to single rooms, we shall now proceed to consider a more compound structure. Thus, let fig. 11, represent a building consisting of two chambers, K L, joined by a passage. The chamber K having a door B communicating with the passage, a window
wrong position of the house with regard to external objects, which, by interrupting the course of the air, makes it assume various directions, and wheel about in eddies, so as to prevent it from ascending with ease from the chimney top, or beat it down into the room with violence. This is more seldom the case of smoky houses than either of the two before mentioned; although it seems to be almost the only one attended to by the persons who pretend to cure smoky houses at present, as most of their remedies are adapted to remove the disorders arising from this cause alone. We shall briefly point out the several cases in which this can occur; that every one may be enabled to judge for himself when these cases are proper or not.

The air (as has been said) is a fluid, and wind a current of that fluid; which, when driven along the surface of the earth, flows with a smooth and equal stream, unless when opposed by some object which interrupts its course; but when it meets with any object which directly opposes its course, it is in some measure pushed back again, and made to spread on every side, till it meets with some open side, towards which it flows with great impetuosity. It is likewise a fluid of considerable gravity, and therefore preys upon the earth with great force; so that, when a current of it flows along the surface of our globe, it has a tendency to move forward and press downward at the same time: from whence it happens, that when a current of air is forced over the top of any high object, the side of which descends perpendicularly downward, the velocity of the current at first overcomes the gravity, and it flies a short way over in that direction; but the power of gravity acting upon the under surface, draws it downward, and in a short time overcomes the impetus that it had to rush forward, and occasions a sort of eddy nearly similar to what we see among water behind a flame which interrupts the violence of its currents.

To illustrate this more plainly, let AB, fig. 12, represent a part of a high building, near to which is a smaller one CD; and let the dotted line EF represent a current of air flowing with considerable force in the direction FE. It is plain that it will flow straight forward over the top of the smaller building; but when it meets with the large object, it will be interrupted in its course, and spread itself on every side, as represented by the dotted lines GG &c. at last it will flow towards that place through which it can escape with the greatest ease. If the opposing object be large, and has no opening through which it can issue near the ground, then it will ascend to the top of it, and flow off in that direction, carrying the smoke which ascends from the small chimney C along with it; but if there is any opening below, either a street or lane, or any other passage that will admit the wind to pass, then will the natural gravity of the air draw the general current downward to flow off through the lower passage; in which case, the smoke which ought to ascend through the chimney C, meeting with a current of air opposing its passage, will not be at liberty to issue forth, but be forced back again into the room from whence it proceeds, unless some contrivance is fallen upon to prevent it.

Again, let A, fig. 13, represent a small building at the side of a great rock B, and the wind coming in the direction CD; when the current of air comes to the point D, being hurried forward with great velocity, it goes a little forward, but soon descends downward, and gradually is reflected more and more inward, as represented by the dotted lines EE, &c. so that, descending downwards upon the top of the chimney A, the smoke is beat back again into the apartments. Thus it is that low houses, when contiguous to high objects, are in danger of being disturb'd with smoke. If the contiguous object be not very high, the disorder may be cured by heightening the chimney of the low house; but if it is very high, it will be necessary to cover the top of the chimney in such a manner as to prevent the wind from entering it, at the same time that a passage is left at some of the sides through which the smoke may issue with freedom. Many are the contrivances which have been invented for this purpose, which are to be met with everywhere; and as there is no difficulty in accomplishing the desired end by an infinite variety of methods, every one who needs such a thing may please his own fancy in the choice. We have thought it unnecessary to add any more but one kind of these, fig. 14, which will answer the end effectually.

It is evident that houses situated near high hills, or thick woods, will be in some measure exposed to the same inconvenience; but it is likewise plain, that if a house be situated upon the slope of a hill, as at F, fig. 13, it will not be in any danger of smoke when the wind blows towards that side of the hill upon which it is situated; for the current of air coming over the house-top in the direction G H, is immediately changed by the slope of the hill to the direction H C, which powerfully draws the smoke upward from the top of the chimney. But it is also evident, that a house in this situation will be liable to smoke when the wind blows from the hill; for the current of air coming downward in the direction C H, will beat downward on the chimney F, and prevent the smoke from ascending with freedom. But the effect will be much heightened, if the doors and windows are chiefly in the lowermost side of the house.

There are some of the most general circumstances which prevent the free ascent of smoke, arising from external objects: but there are many other lesser causes which may at times occasion smoke, all of which it would be tedious here to enumerate; such as, blasts of air, reflected from the sides of mountains, and coming down valleys with great impetuosity, occasioning, in particular situations, eddies or whirlwinds of different forms. In short, whatever in any measure disturbs the free motion of the air, is in danger of producing sudden gulfs, which may occasion smoke. Therefore, whoever builds in a situation which is not altogether free, may lay his account with having some sudden gulfs of smoke, unless he forms the top of his chimney so as to obviate it. And there are some situations so much exposed to sudden gulfs of wind, sometimes whirling round, sometimes beat suddenly downward, or as suddenly carried up again, that it is difficult to guard against every danger. In these situations we would recommend something of the form of what is represented at fig. 15, which would be proof against every wind whatever.

Having thus traced the causes of smoky houses, and reduced them to distinct classes for the sake of distinction, it is necessary before we quit this subject, to observe, that in many cafes, two or more of these may be combined to augment the malady, and therefore it is necessary to have all these circumstances in view in every particular case. It now only remains that we point out the several phenomena which may lead us to distinguish from which of these general causes the disorder complained of may proceed. And,
If it is owing to a fault in the construction of the chimney itself, it will smoke almost continually, especially in calm weather.

If it does not smoke in calm weather, or only when the wind comes from a particular quarter, and can then be cured by opening some door or window, the fault may be looked for in the distribution of the doors or windows of the house. The only case in which there is difficulty in distinguishing whether it is owing to the fault of the chimney or the house, is when it proceeds from too much closeness of the apartment. But this may be easily known by trying it in a calm: for if it proceeds from this cause, there will be no smoke in a perfect calm, if the doors are left open; whereas, if the defect proceeds from a fault in the chimney itself, it will still continue to smoke when calm, even when the doors are open.

When the smoke is occasioned by external causes, there can be generally seen; but it may be likewise known by this, that it proceeds in sudden puffs with great violence at times, even when the doors and windows are not altered. By attending to these few rules with care, there will be little danger of mistaking the cause from whence this disorder proceeds.

We shall conclude these observations with a few remarks on some particular cases which can hardly be reduced to any of the foregoing heads. And,

1st. It sometimes happens, that the smoke is prevented from ascending with freedom, by having a small part of the top of the chimney broken down, so that some parts of it remain higher than others, which in some measure reduces it to the stature of a chimney at the side of a higher one. To prevent this, it is always proper to have the top of the chimney finished with stones neatly cut, and firmly built. It is not to be doubted but that those things, which are placed upon particular chimneys with a view to cure them of smoke, do often, from the same cause, hurt the neighbouring chimneys built in the same wall.

2d. A chamber is sometimes filled with smoke, when a fire is kindled in a neighbouring chimney, and none in it, although there is no appearance of smoke when it has a fire burning in its own grate. This may sometimes proceed from a small hole breaking through the thin partition that divides the two chimneys from one another, and as smoke is a weighty body, which is only buoyed up by the warm air which passes through the fire, when it penetrates into the cold chimney it naturally subside, and comes down to the chamber with which the chimney communicates, when there is no fire to carry it off. But this disease is generally produced by the smoke entering at the top of the chimney, and descending downwards: if this last is the case, it may be cured, on many occasions, by letting a pretty high flue at the top of the chimney, as a division between each two: but the foreif method, in all cases, is to have a smokeboard exactly fitted into the chimney above the grate, which on all occasions effectually prevents it.

3d. It frequently happens, that a chimney does not carry off the smoke well at first when the fire is kindled, although there is not the smallest tendency to it at other times. This proceeds from the narrowness of the chimney; for when the fire is kindled, the whole tube is filled with cold air, as weighty as that in the apartment; and being expanded by the fire at the bottom, it endeavours to ascend upward, but being pent in by the narrowness of the tube, and pressed by the column of cold air above it, it is some time before it can wholly overcome that reflstance, and some of it is forced into the chamber, till by degrees the whole chimney is heated, and then it vents quite well. If the smoke produced by this means is not very troublesome, it may be borne with; but if it be extremely disagreeable, it may be cured by having a large sheet of milled iron, large enough to reach between the two sides of the fire-place, and as deep as to reach from the mantle to the grate, or lower, which might be any contrivance be hung up before the fire at that time to act in some measure as a smoke-chimney. This would quickly make thefire burn, and carry off the smoke entirely. After that is effected, it might then be removed, till another occasion.

SMOLENSKO, the capital of a province of the same name in Muscovy, situated on the confines of Poland: in E. long. 32°, and N. lat. 56°.

SMUGGLERS, in law, those persons who conceal or run prohibited goods, or goods that have not paid his Majesty's customs.

SMUT, in husbandry, a disease in corn, instead of being filled with flour, are full of a sticking black powder.

There are two remedies for this smut, recommended by writers on husbandry; viz. steeping the feed in salt brine, and changing the feed.

As to the steeping of feed, when wheat is intended for drilling, it must be soaked in a brine of pure salt, dissolved in water. Since urine is found to be highly prejudicial. The most expeditious way of brining wheat for drilling, is to lay it in a heap, and wash it with a strong brine sprinkled on it, stirring it up with a shovel, that it may be all equally brined, or wetted with it; after this, stir it up, still stirring more on the same manner till the whole is dusted with the lime: it will then be soon dry enough to be drilled without farther trouble. It must be quick-lime, in its full strength, that is used on this occasion.

The bread made of smutty corn, is very pernicious, acting as a narcotic, and occasioning—not only sleepiness, but vertigo, and even convulsions.

SMYRNA, a city and port-town of Asia Minor, situated on a bay of the Archipelago, in the province of Ionia, in Lat. 30° N. and long. 27° E. Leper Asia, 100 miles north of Rhodes, and 200 miles nearly south of Constantinople: E. long. 27° N. lat. 37° 30'.

SMYRNIUM, in botany, a genus of the pentandria digy.

SNEEZING, a convulsive motion of the muscles of the nose and throat, in consequence of the irritation of the upper membrane of the nose; whereby the air is expelled from the nose with much vehemence and noise.

Sneezing is caused by the irritation of the upper membrane...
Society, in general, denotes a number of persons united in the air, or by medicines called inhalatories.

Snetham, a market-town of Norfolk, twenty-eight miles north-west of Norwich.

Snipe, in ornithology. See Tantalus.

Snow, a meteor produced in this manner: When the vapours become considerably condensed, yet not so far as to be liquified, or dissolved into water; then, by a special degree of coldness in the upper region of the air, the particles of the condensed vapour are changed into ice; several of which adhering together, form little fleeces of a white sub stance, somewhat heavier than the air; and therefore descend in a slow and gentle manner through it; being subject, by reason of its lightness, to be driven about by the various motions of the air and wind; and is what, when arrived to the surface of the earth, we call snow.

Snowfritifies the ground; for instance, by guarding the corn or other vegetables from the intense cold of the air, especially the cold piercing winds.

Snowdon-hill, the highest mountain in Wales, situated in Caernarvonshire.

Snow-drop, in botany. See Galanthus.

Snuff, a powder chiefly made of tobacco, the use of which is too well known to need any description here.

Soalfish, in ichthyology. See Pleuronectes.

Soap, a kind of paste, sometimes hard and dry, and sometimes soft and liquid, much used in washing, whitening linens, and by dyers, fullers, &c. See Chemistry, p. 93, 149, 154.

The purer hard soap is the only sort intended for internal use. This, triturated with oily or resinous matters, renders them soluble in water; and hence becomes an ingredient in pills composed of reiks, promoting their dissolusion in the stomach, and union with the animal fluids. Boerhaave always prescribed soap in resinous pills, unless where an alka lemon or purgative fibre of the juices forbid its use. From the same quality, soap seems well fitted for dissolving oily or unctuous matters and viscidities in the human body; thereby opening obstructions, and digesting all the vessels it passes through. It is likewise a powerful menstruum for the calculus, or stone in the bladder; a solution of it in lime-water being one of the strongest dissolvents that can with safety be taken into the stomach; the virtue of this composition is considerably greater than the aggregate of the dissolving powers of the soap and lime-water when unmixed.

Socage, an ancient tenure, by which lands were held on condition of ploughing the lord’s lands, and doing the operations of husbandry, at their own charges.

Soccus, in antiquity, a kind of high shoe, reaching above the ankle, worn by comedians, as the cothurnus was by tragedians.

Society, in general, denotes a number of persons united together for their mutual affluence, security, interest, or entertainment.

The social principle in man is of such an expansive nature, that it cannot be confined within the circuit of a family, of friends, of a neighbourhood; it spreads into wider systems, and draws men into larger communities and commonwealths; since it is in these only, that the more sublime powers of our nature attain the highest improvement and perfection of which they are capable.
than two guineas annually. Ladies are also admitted members, and foreigners are likewise admitted as honorary or corresponding members. The money of the society is placed in the bank of England, in the name of the president and vice-presidents, three of whom are empowered to draw any from the society shall order to be paid. The society's office is opposite to Beauford buildings in the Strand, in London, where their meetings are held every Wednesday evening, from the second Wednesday in November, to the last Wednesday in May, and at other times every first and third Wednesday of every month.

Society for the reformation of manners, and putting in execution the laws against immorality and profaneness. It was set on foot about forty years ago, by five or six private persons in London, but is since exceedingly increased by numbers of all denominations. A particular body of the most considerable hereof, bear the expense of prosecutions, &c., without any contribution from the rest. These chiefly apply themselves to the prosecuting people for swearing, drunkenness, and prophaning the sabbath. Another body, of about fifty persons, apply themselves to the suppressing lewdness, and by them above five hundred lewd houses have been actually suppressed; a third body consists of confables; and a fourth of informers. Besides these, there are eight other regular mixed bodies of house-keepers and officers, who inspect the behaviour of the confables and other officers, assist in searching disorderly houses, seizing offenders, giving information, &c. There are several other societies of this kind at Bristol, Canterbury, Nottingham, &c.

Society for propagating the gospel in foreign parts, was instituted by king William, in 1701, for securing a maintenance for an orthodox clergy, and making other provisions for the propagation of the gospel in the plantations, colonies, frontiers, &c. To that end he incorporated the archbishops, several bishops, and other nobility, gentry, and clergy, to the number of ninety, with privilege to purchase two thousand pounds per year, inheritance and estates for lives or years, with other goods to any value. They meet yearly on the third Friday of February, to choose a president, vice-president, and other officers; and the third Friday in every month to transact business, and choose by lot persons to take subscriptions for the said funds, and of all money so received to give account to the lord chancellor, &c. They have a standing committee at the chamber-house, to prepare matters for the monthly meeting which is held at St. Martin's library.

Society for propagating Christian knowledge. This was begun in 1699, by some persons of worth, &c. Its original design was to propagate religion in the plantations, to secure the pious education of the poor at home, and to reclaim those that err in the fundamentals of Christianity. In the year 1701, they had procured considerable charities, and transmitted the same to the plantations, in libraries, bibles, catechisms, &c., with a voluntary maintenance for several ministers to be employed in the plantations; but the society for propagating the gospel in foreign parts being then instituted, they were incorporated by charter in the same, and thus discharged as a particular society from the further pursuit of that branch of their original design; whereupon they wholly turned themselves to the other, and are now very considerable by great accessions from the clergy and laity. They meet weekly to concert measures for raising charity for educating poor children, and setting up schools for that purpose, as also for the more regular disposal of books for the instruction of the ignorant, erroneous, &c.

For the other societies established by charter, see College, Company, Incorporation, and Stocks. Society, in Scots law. See Law, Tit. xxi. 5.

SOCII criminiis, in Scots law. See Law, Tit. xxxiii. 50.

SOCINIANs, in church-history, a sect of Christian heretics, so called from their founder Faustus Socinus, a native of Sicena in Italy. He, about the year 1574, began openly to declare against the Catholic faith, and taught, 1. That the eternal Father was the only God; that the Word was no more than an expression of the Godhead, and had not existed from all eternity; and that Jesus Christ was God no otherwise than by his superiority above all creatures who were put in subjection to him by the Father. 2. That Jesus Christ was not a mediator between God and men, but sent into the world to serve as a pattern of their conduct. 3. That the punishment of hell will last but for a certain time, after which the body and soul will be destroyed. And, 4. That it is not lawful for princes to make war. These four tenets were what Socinus defended with the greatest zeal. In other matters, he was a Lutheran or a Calvinist; and the truth is, that he did but refine upon the errors of all the antitrinitarians that went before him.

SOCOTORA, an island in the Indian ocean, about seventy miles long, and fifty broad: situate in E. long. 55°, N. lat. 11°.

SOCRATIC PHILOSOPHY, the doctrines and opinions, with regard to morality and religion, maintained and taught by Socrates. By the character of Socrates left us by the ancients, particularly by his scholar Plato, he appears to have been one of the best and greatest persons in all the heathen world. To him is ascribed the first introducing of moral philosophy, which is what is meant by that usual saying, "That Socrates "first called philosophy down from heaven to earth," that is, from the contemplation of the heavens and heavenly bodies, he led men to consider themselves, their own passions, opinions, faculties, duties, actions, &c. He wrote nothing himself; yet all the Grecian sects of philosophers refer their origin to his discipline, particularly the platonists, peripatetics, academicians, eunomians, &c., but the greatest part of his philosophy we have in the works of Plato.

SODA, or Heat of the stomach, in medicine, the name of a distemper compelling in a heat or troublesome burning about the pit of the stomach, or its left mouth which sometimes is extended the whole length of the esophagus, with a pressure or spasmodic contraction, usually attacking the patient by fits. See Medicine.

SODUBURY, a market-town of Gloucestershire, situated ten miles north-east of Bristol.

SODOMY, the unnatural crime of buggery, thus called from the city of Sodom, which was destroyed by fire for the same. The Levitical law adjudged those guilty of this execrable crime to death, and the civil law assigns the same punishment to it. Our law also makes it felony. There is no statute in Scotland against sodomy; the
libel of the crime is therefore founded on the divine law, and practice makes it punishable by burning alive.

SOFA, in the Turkish customs, a bench of wood raised from the ground about a foot high, and placed round a half or chamber for the people to sit down upon, or to lie along, and in that posture to take a view of what passes in the streets, &c. For these benches are surrounded with windows; they are covered with fine Turkish carpets; and upon that are placed cushions of fattin, flowered with gold or some other rich stuff.

SOFALA, the capital of the territory of that name in Africa, situated at the mouth of the river Sofala, in E. long. 35°, S. lat. 20°.

SOFFITA, or SOFFIT, in architecture, any plaster or ceiling formed of beams of flying cornices, the square compartments or pannels of which are enriched with sculpture, painting or gilding; such are those in the palaces of Italy, and in the apartments of Luxemburg at Paris.

SOFTENING, in painting, the mixing and diluting of colours with the brash or pencil.

SOGLIANA, a country of Asia, situated on the north side of the river Oxus, which separated it from the ancient Bactria, now a part of Ubbe Tartary.

SOHAM, a market-town of Cambridge, situated on a lake called Soham Meer, in the isle of Ely, fourteen miles north-east of Cambridge.

SOIL, in agriculture. See AGRICULTURE, p. 50.

SOISSONS, a city of France, in the province of the isle of France, situated on the river Ayle, fifty-five miles north-east of Paris.

SOL, the Sun, in astronomy, &c. See ASTRONOMY, p. 435.

SOL, in chemistry, is gold. See CHEMISTRY, p. 78.

SOL, in heraldry, denotes Or, the golden colour in the arms of foreign princes.

SOLÆUS, in anatomy. See ANATOMY, p. 209.

SOLANUM, in botany, a genus of the pentandria mono-gynia class. The corolla is rotated; the antherae are very close together, opening with a double pore at the points; and the berry has two cells. There are 30 species, two of them natives of Britain, viz. the nigrum, or common nightshade; and the dulcamara, or woody nightshade.

Common nightshade is used to allay inflammations.

Some years ago, the internal use of the solanum was much recommended by some writers, in cancerous cases, to leach ulcers, and scorfbaric eruptions: however, later experience has shown this simple to be not only of little or no efficacy in such cases, but to be attended with actual danger to the patient.

SOLAR, something belonging to the sun. See ASTRONOMY, p. 435.

SOLDANELLA, in botany, a genus of the pentandria monogynia class. The corolla is bell-shaped, and split into many segments. There is but one species, a native of Switzerland.

SOLDER, a metallic or mineral composition used in soldering or joining together other metals.

Solders are made of gold, silver, copper, tin, bismuth, and lead; usually observing, that in the composition there be some of the metal that is to be soldered mixed with some higher and finer metals. Goldsmiths usually make four kinds of solder, viz. solder of eight, where to seven parts of silver there is one of brass or copper; solder of six, where only a sixth part is copper; solder of four, and solder of three. It is the mixture of copper in the solder that makes solder to come always cheaper than flat. The solder used by plumbers is made of two pounds of lead to one of block-tin. Its goodness is tried by melting it, and pouring the bigness of a crown-piece upon a table; for if good, there will arise little bright shining stars therein. The solder for copper is made like that of the plumbers, only with copper and tin; for very nice works, instead of tin they sometimes use a quantity of silver. Solder for tin is made of two thirds of tin and one of lead: but where the work is anything delicate, as in organ pipes, where the juncture is scarce discernable, it is made of one part of bismuth and three parts of pewter.

SOLDERING, among mechanics, the joining and fastening together two pieces of the same metal, or of two different metals, by the fusion and application of some metallic composition on the extremities of the metals to be joined. See the last article.

To solder upon silver, brass, or iron: take silver, five penny-weight; brass, four penny-weight; melt them together for soft solder, which runs soonest. Take silver, five pennyweight; copper, three penny-weight; melt them together for hard solder. Beat the solder thin, and lay it on the place to be soldered, which must be first fitted and bound together with wire, as occasion requires; then take borax in powder, and temper it like ppp, and lay it upon the solder, letting it dry; then cover it with quick coals, and blow, and it will run immediately; take it presently out of the fire, and it is done. It is to be observed, that if any thing is to be soldered in two places, which cannot well be done at one time, you must first solder with the harder solder, and then with the soft; for if it be first done with the soft, it will unfolder again before the other is soldered. Let it be observed, that if you would have the solder run about the piece that is to be soldered, you must rub such places over with chalk.

In the soldering either of gold, silver, copper, and all the metals before-mentioned, there is generally used borax in powder, and sometimes rosin. As to iron, it is sufficient that it be heated red hot, and the two extremities thus hammered together, by which means they will become incorporated into one another.

SOLDIER, a military man lifted to serve a prince or state, in consideration of a certain daily pay.

SOLE, in the manage, a nail or foot of horn under a horse's foot, which is much more tender than the other horn that compasses the foot, and by reason of its hardnes is properly called the horn or hoof.

SOLEA, in ichthyology. See Pleuronectes.

SOLEÆE, among the Romans, a kind of sandals or flippers, which covered only the sole of the feet, and were bound on with thongs of leather, instead of which the women and the effeminate ones of the other sex tied them on with purple-coloured ribbons, or such as were variously adorned with gold and silver.

SOLECISM, in grammar, a false manner of speaking contrary to the use of language and the rules of grammar, either in respect of declension, conjugation, or syntax.

SELENIUM, in zoology, a genus of insects belonging to the order
order of vermes tectacea. The shell is oblong, bivalved, and opening at both sides; the cardo has a subulate reflected tooth, not inserted into the opposite valve. There are eleven species, distinguished by peculiarities in their shells.

SOLEPAING, in music, the naming or pronouncing the several notes of a song by the syllables ut, re, mi, fa, sol, &c. and in learning to sing it. See Music.

SOLICITOR, a person employed to take care of, and manage suits depending in the courts of law or equity.

There is also a great officer of the law, next to the attorney-general, who is styled the king's solicitor-general; who holds his office by patent, during the king's pleasure. The care and concern of managing the king's affairs, and has fees for pleading, besides other fees arising by patents, &c. He has his attendance on the privy council; and the attorney-general and he were anciently reckoned among the officers of the exchequer; they have their audience, and come within the bar in all other courts.

SOLID, a body whose parts are so firmly connected together, as not to give way, or slip from each other upon the smallest impression, in which sense, solid fluids opposed to fluid.

SOLIDAGO, in botany, a genus of the syngenesia polygamia superflua class. The receptacle is naked; the pappus is simple; the calyx is imbricated with flut scales. There are twelve species, two of them natives of Britain, viz. the virgaurea, or common golden rod; and the cambrica, or Welsh golden rod.

SOLIDITY, that property of matter, or body, by which it excludes all other bodies from that place which itself possesses. See Metaphysics.

SOLILLOQUY, a reasoning or discourse which a man holds with himself; or, more properly, according to Papias, it is a discourse by way of answer to a question that a man proposes to himself. Soliloquies are become very common things on the stage; yet can nothing be more unnatural, than an actor's making long speeches to himself, to convey his intentions to the audience. Where such discoveries are necessary to be made, the poet should rather take care to give the dramatic personages such confidents as may necessarily share their inoffin thoughts, by which means they will be more naturally conveyed to the audience: yet is even this a shift an accurate poet would not be found to have occasion for.

SOLITARY, something retired or in private, remote from the company or commerce of others of the same species.

SOLITARIES, a denomination of nuns of St. Peter of Alcantara, instituted in 1576, the design of which is to imitate the fiercer penitent life of that saint; thus they are to keep a continual silence, never to open their mouths to any body but themselves; employ their time wholly in spiritual exercises, and leave the temporal concerns to a number of maids, who have a particular superior in a separate part of the monastery. They always go bare footed, without sandals, gird themselves with a thick cord, and wear no linen.

SOLMS, the capital of the county of Solms, in the land-grave of Hesse-Cassel, in Germany, thirty-five miles north of Frankfort.

SOLON, in music, a term used in pieces consisting of several parts, to mark those that are to perform alone.

SOLON'S ISLANDS, a cluster of islands in the Pacific ocean, situated between 130° and 140° W. long., and between 7° and 12° S. lat.

SOLON'S SEAL, in botany. See Convallaria.

SOLOTHURN, one of the cantons of Switzerland, lying between those of Basli and Bern, the former on the north, and the latter on the south.

The city of Solothurn, capital of the said canton, is situated in E. long. 7° 15', and N. lat. 47° 18'.

SOLSTICE, in astronomy, that time when the sun is in one of the solstitial points; that is, when he is at his greatest distance from the equator. See Astronomy.

SOLVENT, the same with dissolvent. See Dissolvent.

SOLUTION, in chemistry, denotes an intimate mixture of solid bodies with fluids, so as seemingly to form one homogeneous liquor; the dissolving fluid is termed the dissolvent or menstruum. See Chemistry, paffim.

SOMERSETSHIRE, a county of England, situated on the Bristol channel, and bounded by Wiltshire on the east, by Dorsetshire on the south, and by Devonshire on the west; it is famous for the cloth manufacture.

SOMERTON, a market-town of Somersetshire, twelve miles south of Wells.

SOMME, a river of France, which running from east to west through Picardy, by Amiens and Abbeville, falls into the British channel near St. Vallery.

SONNAMULLI, in medicine, persons who walk in their sleep, otherwise called noctambuli.

SON, an appellation given to a male child, considered in the relation he bears to his parents.

SONATA, in music, a piece, or composition, intended to be performed by instruments only; in which sense, it stands opposed to cantata, or a piece designed for the voice.

SONCHUS, the sow-thistle, in botany, a genus of the syngenesia polygamia sequalis class. The receptacle is naked; the calyx is imbricated, and ventricose; and the pappus is plumose. There are ten species, three of them natives of Britain, viz. the iberica, or common sow-thistle; the arvenis, or tree sow-thistle; and the palustris, or marsh sow-thistle.

Sonchus is accounted cooling and attenuant, and according to the stranguries, as also in inflammations of all kinds, to be applied externally in the form of a cataplasm.

SONG, in poetry, a little composition, consisting of easy and natural verses, set to a tune in order to be sung.

SONG, in music, is applied in general to a single piece of music, whether composed for the voice or an instrument.

SONNA, a book of Mahometan traditions, wherein all the orthodox Mussulmen, or true believers, are required to believe.

SONNET, in poetry, a composition contained in fourteen verses, viz. two stanzas, or measures, of four verses each; and two of three; the eight first verses being all in three rhymes.

SONNETS, among the Mahometans, an appellation given to the orthodox Mussulmen, or true believers; in opposition to the several heretical sects, particularly the schismatics, or followers of Ali.

SOOT, a volatile matter, arising from wood, and other fuel, along with the smoke; or rather, it is the smoke itself, fixed and gathered on the sides of the chimney. See Chemistry, p. 158. and Agriculture, p. 49.
SOPHIST, a title given to the emperor of Persia; importing as much as wise, sage, or philosopher. There is no prince in the world whose authority is more absolute than that of the soplh of Persia.

SOPHISM, in logic, &c. an argument which carries much of the appearance of truth, and yet leads into error.

SOPHIST, a person who ufs sophisms, with a view to deceive those he would persuade or convince.

SOPHISTICATION, the adulterating any thing with what is not good or genuine; a practice too common in the making up medicines for sale; as also among vintners, distillers, and others, who are accused of softificating their wines, spirits, oils, &c. by mixing with them cheaper and coarser materials; and, in many cases, the cheat is carried on so artfully as to deceive the best judges.

SOPHOPRA, in botany, a genus of the decandria monogy clafs. The calix has five teeth, and is glibbous above; the corolla is papilionaceous, with the wings of the same length as the vexillum; and the cappole is a legumen. There are eight species, none of them natives of Britain.

SOPORIFIC MEDICINES, are those capable of procuring sleep, as opiates, &c. See OPIATES, &c.

SORBONNE, the house or college of the faculty of theology, in the university of Paris; sometimes also used for the faculij itself, because it usually assembles in the house of the forbonne.

SORBUS, in botany, a genus of the icofandria trigynia clafs. The calix consists of five leaves, and the corolla of five petals; and the berry contains three seeds. There are three species, two of them natives of Britain, viz. the domestica, or the true service or forb; and the aucuparia, quicken-tree, or mountain-ash.

SORCERY, the crime of witchcraft or divination by the aid of an evil spirit. See Witchcraft.

SORET, a province of the Hither India, lying northwards of Guzerat: its chief town is Jaganat.

SOREX, in zoology. See Mus.

SORITES, in logic, a species of reasoning, in which a great number of propositions are so linked together, that the predicate of the one becomes continually the subject of the next following, till at last a conclusion is formed by bringing together the subject of the first proposition and the predicate of the last. See LOGIC.

SOTERIA, in antiquity, sacrifices offered to the gods for delivering a person from danger; as also poetical pieces composed for the same purpose.

SOTOVENTO ISLANDS are situated on the coast of Terra Firma; the chief of which are Trinidad, Margareta, Tortuga, &c. They are also called the Leffer Antilles.

SOUBISE, a town of Guienne, in France. Situated on the river Charente, seventeen miles south of Rochelle.

SOUFFLAGE, a species of divination, performed by means of fortes or lots.

The fortes prenexit, famous in antiquity, consisted in putting a number of letters, or even whole words, into a urn; and then, after shuffling them together, they were thrown on the ground, and whatever sentences could be made out from them constituted the answer of the oracle.

Another kind of fortes consisted in taking some celebrated poet, as Homer or Virgil; and, opening the book, whatever presented itself first to the eye made the answer; and hence it got the name of fortes homericse, and fortes or lots.

The fortes prenexit, famous in antiquity, consisted in taking some celebrated poet, as Homer or Virgil; and, opening the book, whatever presented itself first to the eye made the answer; and hence it got the name of fortes homericse, and fortes or lots.

SOUGHS, among miners, denotes a passage dug underground, to convey off water from mines.

SOVEREIGN, in matters of government, is applied to the supreme magiftrate, or magiftrates, of an independent government or state; by reason their authority is only bounded by the laws of God, of nature, and the fundamental laws of the state; such are kings, princes, &c.

SOUL, a spiritual substance, which animates the bodies of living creatures; it is the principle of life and activity within them.

Various have been the opinions of philosophers concerning the subsistence of the human soul. The Cartelians make thinking the essence of the soul. Others again hold, that man is endowed with three kinds of souls, viz. the rational, which is purely spiritual, and infused by the immediate inspiration of God; the irrational, or sensitive, which is common to man and brutes; and lastly, the vegetative soul, or principle of growth and nutrition.

That the soul is an immaterial subsistence appears from hence, that its primary operations of willing and thinking have not only no connection with the known properties of body, but seem plainly inconsistent with some of its most essential qualities. For the mind discovers no relation between thinking and the motion and arrangement of parts.

As to the immortality of the human soul, the arguments to prove it may be reduced to the following heads: 1. The nature of the soul itself, its desires, sense of moral good and evil, gradual increase in knowledge and perfection, &c. 2. The moral attributes of God.

Under the former of these heads it is urged, that the soul, being an immaterial intelligent subsistence, does not depend on the body for its existence; and therefore may, nay, and must, exist after the dissolution of the body, unless annihilated by the same power which gave it a being at first. This argument, especially if the infinite capacity of the soul, its strong desire after immortality, its rational activity and advancement towards perfection, be likewise considered, will appear perfectly conclusive to men of a philosophical turn; because nature, or rather the God of nature, does nothing in vain.

But arguments drawn from the latter head, viz. the moral attributes of the Deity, are not only better adapted to convince men unacquainted with abstract reasoning, but equally certain and conclusive with the former: for as the justice of God can never suffer the wicked to escape unpunished, nor the good to remain always unrewarded; therefore, arguments drawn from the manifest and confvant prosperity of the wicked, and the frequent unhappiness of good men in this life, must convince every thinking person, that there is a future state wherein all will
SOUP, a kind of pottage made of bread and broth, or the
SPAW, a town of Germany, in the circle of Westphalia,
SOUTHPETHERTON, a market town of Somersetshire,
SOUTH, one of the four cardinal points from which the
SOURIS, in the manege, is a cartilage in the nostrils of a
Sow, in the iron-works, the name of the block or lump of
SOUTHWOULD, a port-town of Suffolk, situated on a
SOUTHMOULTON, a market-town of Devonshire, situate-
SOUTHWARK, a borough of Surrey, and a suburb to
SOUTHERN-WOOD, in botany. See Artemisia.
SOUTHMOUTON, a market-town of Devonshire, situate-
SPALDING, a market town of Lincolnshire, situated
SPALATRO, a city and port-town of Dalmatia, situated
SPAN, a measure taken from the space between the thumb's
SPANIEL, in zoology. See Canis.
SPAN, in natural history, a class of fossils, not inflammable
SPAR, in natural history, a class of fossils, not inflammable
SPAR, in natural history, a class of fossils, not inflammable
SPAGIRIC art, a name given by authors to that species
SPACE is defined by Mr Locke to be a simple idea
SPACE, in geometry, denotes the area of any figure,
SPANDAW, a town of Germany, in the circle of Saxony,
SPAN, a measure taken from the space between the thumb's
SPAN, a measure taken from the space between the thumb's
SPAN, a measure taken from the space between the thumb's
SPAIN, including Portugal, is a large peninsula of Eu-
SPAHIV, horsemen in the Ottoman army, chiefly raid-
SPAIN, a large peninsula of Europe, lying between 40°
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SPAIN, including Portugal, is a large peninsula of Eu-
SPANISH, a market-town of Lincolnshire, situated under the meridian of London, thirty miles south-east of Lincoln.
SPAN, a measure taken from the space between the thumb's end and the tip of the little finger, when both are stretched out. The span is estimated at three hand's breadths, or nine inches.
SPANDAW, a town of Germany, in the circle of Saxony, and Marquisate of Brandenburg, situated on the river Havel, eight miles north-west of Berlin.
SPANIEL, in zoology. See Canis.
SPAR, in natural history, a class of fossils, not inflammable nor soluble in water; when pure, it is pellucid and colourless, and imitating the appearance of crystal, but wanting its distinguishing characters; composed of plane and equable plates, not flexible nor elastic, not giving fire with steel, readily calcining in a small fire, and fermenting violently with acids, and wholly soluble in them.
The spars, in general, are found in the fissures of stones, and about mines. Derbyshire affords enough of them to supply the whole world; and the German mines afford yet larger quantities.
SPARADAPUM, in pharmacy. &c. a sort of cerecloth, called also tela Quarters, the form whereof is directed as follows. Take of the diaphalma plaster, and diachylon with the gums, each one pound; ceruse, half a pound; root of oris finely powdered, an ounce and a half. Mix these together, and whilst they are in fusion, dip them in soft worn-out linen rags, so that they may be covered with the plaster on each side; then take them out, spread them, and let them dry; and smooth the surfaces with

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SPARTIUM, in botany, a genus of the moncecia triandria clafs. The amentum of both male and female is roundish; and the calyx of both consists of three leaves; neither of them have any corolla; the stigma of the female is bifid; and the drop is dry, and contains two seeds. There are two species, both natives of Britain, viz. the erectum, or great-bur-reed; and the natans, or leaf-bur-reed.

SPARROW, in ornithology. See Fringilla.

SPARROW-HAWK, in ornithology. See Falco.

SPARTIUM, in botany, a genus of the diadeiphia decan-

SPASM, in medicine, a convulfion.

SPASMODIC, something belonging to a fpasm or convul-

SPAVIN, in the manege, a difeafe in horfes, being a fwell-

SPATHA, in botany. See Botany, p. 636.

SPAYING, or Spading, the operation of caftrating the
dna clafs. The fligma is longitudinal, and downy above;

SPATHA, in botany. See Frigilla, p. 568.

SPARFIVENTO, or the moft southern point or pro-

SPARUS, in ichthyology, a genus belonging to the order

SPECIES, in optics, the image painted on the retina, by

There are two fpecies, both natives of Britain, viz. the

SPERMATIS, in botany. See Botany, p. 636.

SPECIFIC, in philofophy, that which is peculiar to any

SPECULATIVE, something relating to the theory of fome

Speculum, in furgery, an inftrument for dilating a wound,

SPELL, in general, denotes the -'

SPELLING, in grammar, that part of orthography which
SPIE, a river of Scotland, which, running north-east, through Badenoch and Murray, falls into the German sea, east of the frith of Murray.

SPHELUS, in surgery and medicine, an absolute and perfect corruption or death of the parts. See Medicine and Surgery.

SPHENOID, in geometry, a solid, approaching to the figure of a sphere. The spheroid is generated by the entire revolution of a semi-ellipsoid about its axis.

SPHERICAL, in anatomy, something belonging to the sperm or seed. See Anatomy, p. 270.

SPERMACOCE, in botany, a genus of the tetrandria monogynia clafs. The corolla consists of one funnel-shaped petal; and it has two bidentated seeds. There are six species, none of them natives of Britain.

SPERMATIC, in anatomy, something belonging to the sperm or seed. See Seed.

SPERM-CASTI, a white flaky substance, prepared from the oil of a species of whale, called phystrer macrocephalus. See Physyter.

SPERMATIC, in anatomy, something belonging to the sperm or seed. See Anatomy, p. 270.

SPIE, a river of Scotland, which, running north-east, through Badenoch and Murray, falls into the German sea, east of the frith of Murray.

SPHACELUS, in surgery and medicine, an absolute and perfect corruption or death of the parts. See Medicine and Surgery.

SPEARANTHUS, in botany, a genus of the syngenefia class. The calyx consists of five segments, and the carpellae of the female of four; neither of them have any corolla; the styli are four; and there is one hard seed within the calyx. The species are two, none of them natives of Britain.

SPERGULA, in botany, a genus of the decandria pentandria class. There are five species, three of them natives of Britain, viz. the arvensis, or corn-spergule; the pentandria, or small spergule; and the nodosa, or knotted spergule.

SPERM, See Seed.

SPERM-CASTI, a white flaky substance, prepared from the oil of a species of whale, called physyter macrocephalus. See Physyter.

SPERMEL, in the glass-trade, an iron instrument, hooked at the end, and pointed, with which the workmen take the metal up out of the melting-pots, for proofs or essays, to see whether it be fit for work.

SPERGELOMBEGO, a town of Italy, in the territory of Venice, and province of Friuli: situated forty-five miles north of Venice.

SPILSBY, a market-town of Lincolnshire: situated twentyseven miles east of Lincoln.

SPINA VENTOSA, in surgery, that species of corruption of the bones which takes its rise in the internal parts, and by degrees enlarges the bone, and raises it into a tumour. See Surgery.

SPINACHIA, in botany, a genus of the dicocia pentandria class. The calyx is imbricated. There are two species, none of them natives of Britain.

SPINARANTHUS, in botany, a genus of the syngeneria class. The anthers are opearculated, and there is no calyx. The species are three, all natives of Britain, viz. the palustre, or grey bog-moss; the alpinum, or mountain bog-moss; and the arborescent, or creeping bog-moss.

SPIGNUS, in botany, a genus of the cryptogamia class. The antherae are apertor, and there is no calyptra. The species are three, all natives of Britain.

SPINEL, or Spinnet, a musical instrument, ranked in the second or third place among harmonious instruments.

SPINNING, the act or art of reducing silk, flax, hemp, wool, hair, or other matters, into thread. Spinning is either performed on the wheel with a distaff and spindle, or with other machines proper for the several kinds of working. Hemp, flax, nettle-thread, and the like vegetable matters, are to be wetted in spinning; silks, wool, &c. are to be spun dry, and do not need water; but there is a way of spinning silk as it comes off the cages or balls, where hot and even boiling water is to be used.

SPINOZISM, the doctrine of Spinoza, or atheism and pantheism proposed after the manner of Spinoza, who was born a Jew at Amsterdam.

The great principles of Spinozism, is, that there is nothing properly and absolutely existing besides matter and the modifications of matter; among which are even comprehended thought, abstract and general ideas, comparisons, relations, 'combinations of relations, &c.

The chief articles in Spinoza's system are reducible to thes. There is but one substance in nature; and that this only-substance is endowed with an infinite number of attributes, among which are extension and cognition; that all the bodies in the universe are modifications of this substance considered as it is extended, and that all the souls of men are modifications of the same substance considered as cogitative: that God is a necessary and infinitely perfect Being, and is the cause of all things that exist,
exist, but not a different being from them: that there is but one being and one nature, and that this nature produces within itself, by an immanent act, all those which we call creatures; and that this being is at the same time both agent and patient, efficient cause and subject, but that he produces nothing but modifications of himself.

SPIRAEA, in botany, a genus of the icofandria pentagymia class. The calix consists of five segments, and the corolla of five petals; and the capsule contains many seeds. There are eleven species, none of them natives of Britain.

SPIRAL, in geometry, a curve line of the circular kind, which, in its progress, recedes from its center.

SPIRAL, in architecture and sculpture, implies a curve that ascends, winding about a cone or spire, so as all the points thereof continually approach the axis. It is distinguished from the helix, by its winding around a cone, whereas the helix winds in the same manner around a cylinder.

SPIRE, in architecture, was used by the ancients for the base of a column, and sometimes for the auralt or tere. But among the moderns, it denotes a spire that continually diminishes as it ascends, whether conically or pyramidaly.

SPIRE, in geography, an imperial city of Germany, capital of a bishopric of the same name, and situated in the palatinate of the Rhine, fifteen miles south-west of Heidelberg: E. long. 8° 17', N. lat. 49° 16'.

SPIRIT, in metaphysics, an incorporeal being or intelligence; in which sense, God is said to be a spirit, as are angels and the human soul.

SPIRITiES, or ANIMAl SPIRiTiES, in physiology. See ANATOMY, p. 253, and there.

SPIRIT, in chemistry, a name applied to several very different substances. However, in general, it denotes any distilled volatile liquor that is not infipid, as phlegm, or pure water, not inflammable as oil; but under this general idea are comprehended liquors of quite opposite natures, some being acid, and others alkaline; which latter are such enemies to the former, that as soon as they are put together, they raise a violent effervescence, and grow hot: and to these may be added a third sort, called vinous or inflammable spirits; which, though very subtil or penetrative, are not manifestly either acid or alkaline. See CHEMISTRY, p. 69, 95, 161, &c.

SPIRiTuaL, in general, something belonging to, or partaking of, the nature of spirit. See SPIRIT.

SPIRiTUALITYiES of a bishop, are the profits he receives as a bishop, and not as a baron of parliament: such are the duties of his vifitation, presentation money, what arises from the ordination and institution of priests, the income of his jurisdiction, &c.

SPIrHEAD, a road between Portsmouth and the isle of Wight, where the Royal navy of Great Britain frequently rendezvous.

SPIrLLE, in physiology. See SALIVA.

SPIrTZBERGEN. See GREENLAND.

SPIrACLUM, in botany, a genus of the cryptogamia musci class. The calix of the male flower is smooth conic calyptra; the anthera are cylindric; and the receptacle coloured, membranaceous, and very large. There are four species, only one of them, viz. the ampliscaleum, a native of Britain.

SPIRiT, in metaphysics, an incorporeal being or intelligence; in which sense, God is said to be a spirit, as are angels and the human soul.

SPIRiT, in chemistry, a name applied to several very different substances. However, in general, it denotes any distilled volatile liquor that is not infipid, as phlegm, or pure water, not inflammable as oil; but under this general idea are comprehended liquors of quite opposite natures, some being acid, and others alkaline; which latter are such enemies to the former, that as soon as they are put together, they raise a violent effervescence, and grow hot: and to these may be added a third sort, called vinous or inflammable spirits; which, though very subtil or penetrative, are not manifestly either acid or alkaline. See CHEMISTRY, p. 69, 95, 161, &c.

SPLENiUS, a person affected with obstruction of the spleen.

SPLENiUS, in anatomy. See ANATOMY, p. 216.

SPLENt, or SPLINT, among farriers, a callous, inessential excrescence, breeding on the shank bone of horses. See Farriery, p. 573.

SPLiCiNg, in the sea-language, is the unwitting the ends of two cables or ropes, and working the several strands into one another by a fidd, so that they become as strong as if they were but one rope.

SPODiuM, in pharmacy, one of the fouleft recurrences of copper.

SPOTS, whatever is taken from the enemy in time of war.

SPOtting, in the lea-language, is said of a ship, which, being under sail in a storm at sea, is unable to bear it, and accordingly, called fiddclae and maculae.

SPOW, or WATER-SPOT, an extraordinary and dangerous meteor, observed at sea, and sometimes at land, called by the Latins typho and sipho. Its first appearance is in form of a deep cloud, the upper part of which is white, and the lower black: then from the lower part of this cloud hangs, or rather falls down, what is properly called the spout, in form of a conical tube, biggish at top; and under this tube, there is always a great boiling.
boiling and flying up of the water of the sea, as in a
jet d'eau. For some yards above the surface of the sea,
the water stands as a column or pillar, from the extreme
ity whereof it spreads and goes off, as in a kind of
smoke. Frequently, the cone descends so low, as to
touch the middle of this column, and continue for some
time contiguous to it; though sometimes it only points
to it, at some distance, either in a perpendicular or
oblique line. Frequently it is scarce distinguishable
whether the cone or the column appear the first, both
appearing all of a sudden against each other. But some-
times the water boils up from the sea to a great height,
without any appearance of a spout pointing to it, either
perpendicularly or obliquely. Indeed, generally, the
boiling or flying up of the water has the priority, this
always preceding its being formed into a column. Gen-
erally, the cone does not appear hollow, till towards
the end, when the sea-water is violently thrown up along
its middle, as smoke up a chimney. Soon after this, the
spout or canal breaks and disappears; the boiling up of
the water, and even the pillar, continuing to the half,
and for some time afterwards; sometimes till the spout
form itself again, and appear anew; which it sometimes
does several times in a quarter of an hour.

M. de la Pyme, from a near observation of two or
three spouts in Yorkshire, described in the Philosophical
Transactions, gathers, that the water-spout is nothing but
a gyration of clouds by contrary winds, meeting in a
point or centre; and there, where the greatest condensa-
tion and gravitation is, falling down into a pipe or great
tube, somewhat like Archimedes' spiral screw; and in
its working and whirling motion, absorbing and rai-
ning the water, in the same manner as the spiral screw does;
and thus destroying ships, &c.

SPRING, in ichthyology. See Clupea.

SPRING, in natural history, a fountain or source of water,
rising out of the ground. See Hydrostatics.

Spring, in mechanics, denotes a thin piece of tempered
steel, or other elastic substance; which, being wound up,
serves to put several machines in motion by its elas-
ticity, or endeavour to unbend itself; such is the spring of
a clock, watch, and the like.

SPRING-TIDE. See Astronomy, p. 473, &c.

SPRUNG. See Spongia.

SPUN, yarn, among sailors, is a kind of line made from
rop yarn, and used for seizing or fastening things to-
gether.

SPUR, a piece of metal, confining of two branches em-
passing a horseman's heel, and a rowel in form of a star,
advancing out behind to prick the horse.

SPURGE, in botany. See Euphorbia.

SPURGE LAUREL. See Daphne.

SPURKETS, in a ship, spaces between the upper and lower
futtocks, or betwixt the rungs fore and aft.

SPURRY, in botany. See Spergula.

SPUTUM, among physicians, denotes the same with the
saliva or spittle. See Saliva.

SPY, a person hired to watch the actions, motions, &c.

SQUADRON, in military affairs, denotes a body of horse
whose number of men is not fixed; but is usually from
one to two hundred.

SQUADRON OF SHIPS, a division or part of a fleet, com-
manded by a vice-admiral, or commodore.

SQUALUS, the shark kind, in ichthyology, a genus
belonging to the order of ammamia nantes. There are
five spiracula, one on each side of the neck; the body is
ob-
long, and somewhat cylindrical; and the mouth is situ-
ated in the anterior part of the head. There are 15 spe-
cies, all inhabitants of the ocean.

SQUAMARIA, in botany. See Lathraea.

SQUAMOUS, in anatomy, an appellation given to the spar-
ious or scale-like virtues of the skin, because composed of
squares or scales like those of fish. See Anatomy, p. 153.

SQUARE, in geometry, a quadrilateral figure, both equi-
lateral and equiangular. See Geometry.

SQUARE ROOT. See Arithmetick, p. 420.

SQUATINA. See Squalus.

STABLE, a place or house for horses, &c. furnished with
stalls and proper apartments to contain their food, &c.

STADTHOLDER, the principal governor or magistrate
of the United Provinces.

STADIUM, an ancient Greek long measure.

STAG, in zoology. See Sciurus.

STICK, in botany. See Scilla.

STINTING. See Strabismus.

STIRK, in zoology. See Sciurus.

STABLE, a place or house for horses, &c. furnished with
stalls and proper apartments to contain their food, &c.

STACHYS, in botany, a genus of the didynamia gymno-
perma class. The upper labium is vaulted, and the inferior
one reflected in the edges; the intermediate labium being
larger, and emarginated; and the flaminia are reflected
towards the sides. There are 12 species, three of them natives
of Britain, viz. the germanica, or base hore-hound; the flan-
mia, or hedge nettle; and the palusiris, or clown's gall, heal.

STADIUM, an ancient Greek long measure.

STADIUM was also the course or career wherein the
Greeks ran their races.

STADTHOLDER, the principal governor or magistrate
of the United Provinces.

The stadtholder seems to be impowered, either direc-
tly or by his influence, to change both the deputies, mag-
istrates, and officers, in every province and city. He is
president in the states of every province, though he has
not so much as a seat or vote in the states-general; but
as he influences the states of each province to send what
deputies he pleases to the states-general, he has, in effec-
t, the appointing the persons that constitute the states-
general, and may be deemed sovereign of the united pro-
vinces. The stadtholders had once a very great power.
We find one of their stadtholders appointing what towns
should send deputies or members to the assembly of the
states of Holland: but the stadtholdership was never he-
reditary till now, when in the year 1747 it was made so
in the family of Orange.
STAEHELINA, in botany, a genus of the family Polygonaceae. The receptacle is naked; the pappus is feathered; and the calyx is imbricated with scales, membranaceous, coloured, and reflected at the points. There are two species, none of them natives of Britain.

STAFF, an instrument ordinarily used to rest on in walking. The staff is also frequently used as a kind of natural weapon both of offence and defence, and for several other purposes.

STAFFORD, the county-town of Staffordshire, is situated one hundred and thirty miles north-west of London. It sends two members to parliament.

STAGGERS. See Farriery, p. 552.

STAINES, a town of Middlesex, situated nineteen miles south of London. It sends two members to parliament.

STAIR-CASE, in architecture, an ascent inclosed between walls, or a balustrade, consisting of stairs, or steps, with landing-places and rails, serving to make a communication between the several stories of a house. See Architecture, p. 360.

STALACTITE, in natural history, crystalline spars formed into oblong, conical, round, or irregular bodies, composed of various crusts, and usually found hanging in form of icicles from the roofs of grottos, &c.

STALBRIDGE, a market-town of Dorsetshire, situated eighteen miles north of Dorchester.

STALK, in botany, that part of a plant which rises immediately from the root, and which supports the leaves of the flowers and the fruit.

STALLION, or Stone-horse, in the menage, an ungelt horse, designed for the covering of mares, in order to propagate the species. See Equus.

STAMFORD, a borough-town of Lincolnshire, situated thirty-five miles south of Lincoln. It sends two members to parliament.

STAMINA, in the animal body, are defined to be those simple original parts, which exist first in the embryo, or even in the seed; and by whose distillation, augmentation, and accretion, by additional juices, the animal body, at its utmost bulk, is supposed to be formed.

STAMINEOUS, in botany, a term for those flowers of plants which have no petals or flower-leaves, but consist only of a number of stamens and pistils placed in a cup.

STAMP-DUTIES, certain impositions laid on all parchment and paper, on which deeds, grants, or other instruments, or any processes in law or equity, are ingrossed or written. These duties, when first granted, were from forty shillings for letters-patent, &c. to sixpence for the usual deeds; and one penny for declarations, pleadings, &c. They have been, in general, doubled and trebled, by subsequent statutes; and the common stamp now is the treble sixpenny. Persons writing or engrossing anything charged with the duty on parchment or paper, before it is stamped, or if it be marked with any lower duty than what is required, are liable to forfeit ½; and the deed shall not be deemed good in law, till such penalty is paid, and the same be stamped, &c.

STAMPALIA, an island of the Archipelago, about fifty miles in circumference, situated in E. long. 26° 30’, and N. lat. 36° 20’.

STANCHION, or Stanchions, in a ship, those pillars, which being set up piller-wise, do support and strengthen the waile-trees.

STAND, in commerce, a weight, from two hundred and a half to three hundred, of pitch.

STANDARD, in war, a fort of banner, or flag, borne as a signal for the joining together of the several troops belonging to the same body. See Flag, &c.

STANDARD, in commerce, the original of a weight, measure, or coin, committed to the keeping of a magistrate, or deposited in some public place, to regulate, adjust, and try the weights used by particular persons in traffic. See Money.

STANDON, a town of Hertfordshire, situated under the meridian of London, and seven miles north of Hertford.

STANHOPE, a market-town of Durham, situated sixteen miles south of Durham.

STANLEY, a town of Gloucestershire, situated twelve miles south of Glocester.

STANNARIES, the mines and works where tin is dug and purified, as in Cornwal, Devonshire, &c. There are four courts of the stannaries in Devonshire, and as many in Cornwal; and great liberties were granted them by several acts of parliament in the time of Edward I. &c. though somewhat abridged under Edward III., and Charles I.


STANTON, a town of Lincolnshire, situated seventeen miles east of Lincoln, under the meridian of London.

STANZA, in poetry, a certain dated number of verses, generally containing a perfect sense, that ought to end with some lively and ingenious thought, or just and pertinent reflection.

STAPELIA, in botany, a genus of the pentandria tri-clas of plants. The plant is contorted, with a double star-like nectarium covering the fructification. There are two species, both natives of the Cape of Good Hope.

STAPES, in anatomy. See Anatomy, p. 296.

STAPHYLÆA, in botany, a genus of the pentandria tri-gynia clas. The calyx consists of five segments, and the corolla of five petals; the capsules are inflated and conuate; and there are two globular seeds. There are two species, both natives of the Cape of Good Hope.

STAPHYLINUS, in zoology, a genus of insects belonging to the order of coleoptera: the antennae are slender; the elytra are dimidiated, and cover the wings; and the tail is simple, and furnished with two oblong bladders. There are 17 species, principally distinguished by their colour.

STAPLE primarily signifies a public place or market, whether
Falling Stars, in meteorology, fiery meteors, which dart through the sky, in form of a star; being occasioned by a nitro-sulphurous matter, the common cause of all such meteors.

Star, in heraldry, a charge frequently borne on the shield, the garter, bath, and triple. See Garter.

Star-board, in the sea-language. denotes the right-hand side of a ship; thus they say, star-board the helm, or helm a star-board, when he that conds would have the men at the helm, or steering-wheel, put to the right-hand side of the ship.

Star chamber, a chamber at Westminster, so called from the part of the body; and some species have one of the rays bifid; so as to emulate the appearance of a six-rayed kind.

Star-chest. See Centaurea.

Starling. See Sturnus.

Stars. See Asterias.

Star shot, a gelatinous substance frequently found in vessels wherein wheat has been steeped in water; of which fevula, after separating the bran from it, by passing it through sieves, they form a kind of loaves, which being dried in the sun or an oven, is afterwards cut into little pieces, and so fold. The bell stalk is white, fiof, and friable, and easily broken into powder. Such as require fine stalk do not content themselves, like the stalk-men, with refuse wheat, but use the finest grain. The process is as follows: The grain being well cleaned is put to ferment in vessels full of water, which they expose to the sun while in its greatest heat, changing the water twice a day, for the space of eight or twelve days, according to the season. When the grain bursts easily under the finger, they judge it sufficiently fermented. The fermentation perfected, and the grain thus softened, it is put, handful by handful, into a canvas bag, to separate the flour from the husks, which is done by rubbing and beating it on a plank laid across the mouth of an empty vessel that is to receive the flour.

As the vessels are filled with this liquid flour, there is seen swimming at the top redish water, which is to be carefully fumed off from time to time, and clean water is to be put in its place; which, after flirring the whole together, is also to be strained through a cloth of sieve, and what is left behind put into the vessel with new water, and exposed to the sun for some time. As the fermentation thickens at the bottom, they drain off the water four or five times, by inclining the vessel, but without passing it through the sieve. What remains at bottom is the stalk, which they cut in pieces to get out, and leave it to dry in the sun. When dry, it is laid up for use.

Star-stone, in natural history, a name given to certain extraneous fossiliferous stones, in form of short, and commonly means, but crooked, columns, composed of several joints; each resembling the figure of a radiated star; with a larger or smaller number of rays in the different species; they are universally found of about an inch in length, and of the thicknees of a goose-quill. Some of them have five angles, or rays, and others only four, and in some the angles are equi-distant, while in others they are irregularly so; in some also they are short and blunt, while in others they are long, narrow, and pointed; and some have their angles so very short and obtuse, that at first sight they might be taken for entrochoasteries. The several joints in the same specimen are usually all of the same thicknees; this however is not always the case, but in some they are larger at one end, and in others at the middle, than in any other part of the body; and some species have one of the FOTHER MERCHANTS, &c. are obliged to bring their goods to be bought by the people, as the Greve, or the places along the Seine, for sale of wines and corn, at Paris, whether the merchants of other parts are obliged to bring those commodities.

Formerly the merchants of England were obliged to carry their wool, cloth, lead, and other like staple-commodities of this realm, in order to utter the same by wholesale; and these staples were appointed to be constantly kept at York, Lincoln, Newcastle upon Tyne, Norwich, Welfminster, Canterbury, Chechester, Winchester, Exeter, and Bristol; in each whereof a public mast was appointed to be kept, and each of them had a court of the mayor of the staple, for deciding differences, held according to the law-merchant, in a summary way.

STAR, in astronomy. See Astronomy, passim.

Falling Stars, in meteorology, fiery meteors, which dart through the sky, in form of a star; being occasioned by a nitro-sulphurous matter, the common cause of all such meteors.

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Star-chest. See Centaurea.

Starling. See Sturnus.

Start-point, a cape or promontory of Devonshire, in the English channel, twelve miles south of Dartmouth.

State, or estate, an empire, kingdom, province, or extent of country under the same government.

States, or Estates, a term applied to several orders or classes of people assembled to consult of matters for the public good.

Thus states-general is the name of an assembly consisting of the deputies of the seven United Provinces; these are usually thirty in number, some provinces sending two, others more; and whatever resolution the states-general take, must be confirmed by every province, and by every city and republic in that province, before it has the force of a law. The deputies of each province, of what number ever they be, have only one voice, and are esteemed as
as but one person, the votes being given by provinces. Each province prefides in the assembly in its turn, according to the order settled among them. Guelderland prefides first, then Holland, &c.

States of Holland are the deputies of eighteen cities, and one representative of the nobility, constituting the states of the province of Holland: the other provinces have likewise their states, representing their sovereignty, deputies from which make what they call the states-general. In an assembly of the states of a particular province, one dissenting voice prevents their coming to any resolution.

Statice, in botany, a genus of the pentandria trigyna class. The calix is one entire plaited leaf; the corolla consists of five petals; it has but one seed. There are 14 species, three of them natives of Britain, viz. the armoria, or sea gilly-flower; the limonium, or sea-lavender; and the reticulata, or matted sea-lavender.

Statics, that branch of mathematics which considers the motion of bodies arising from gravity. See Hydrostatics, and Mechanics.

Station, in geometry, surveying, &c., a place pitched upon to make an observation, take an angle, or the like.

Stationary, in astronomy, signifies the appearance of a planet, when it seems to remain immovable on the same point of the zodiac for several days. See Astronomy.

Stationary-days, in church-history, an appellation given to figures or statues of princes that were not kept with such rigour and strictness as Lent.

Stationary, in its general sense, signifies a law, ordinance, decree, &c. See Law, &c.

Statute, in our laws and customs, more immediately signifies an act of parliament made by the three estates of the realm: and such statutes are either general, of which the courts at Westminster take notice, without pleading them; or they are special and private, which last must be pleaded.

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Stavanger, a port-town of Norway, in the province of Bergen, capital of the territory Stavenger, situated on the peninsula in the German ocean: E. long. 6° 30', N. lat. 59° 30'.

Stavoren, a port-town of the United-Netherlands, in the province of West Friesland, situated on a peninsula in the German ocean: E. long. 6° 30', N. lat. 59° 30'.

Steatites, in the history of fossils, a name given by
STEERING in navigation, the directing a vessel from one place to another by means of the helm and rudder. He is held the best steersman who cau[es the least motion in putting the helm over to and again, and who keeps the ship from making yaws, that is, from running in and out. See Navigation.

STEERING, on board a ship. The stemmen say the bowspirt or the beam head of a ship fleves, when it flands too upright, or not straight enough forward.

STEERINGAGE, on board a ship. That part of the ship next below the quarter-deck, before the bulk-head of the great cabin, where the fleersman stands in most ships of war. See the next article.

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STERLING, a term frequent in British commerce. A pound, shilling, or penny Sterling, signifies as much as a pound, shilling, or penny of lawful money of Great Britain, as settled by authority. See Money.

STERN of a ship, usually denotes all the hindmost part of her, but properly it is only the outmost part abaft.

STERNBERG, a town of Germany, in the circle of Upper Saxony and marquise of Brandenburg, situated twenty-three miles north-east of Frankfort upon the Oder.

STERNHOYIDÆUS, in anatomy. See Anatomy, p. 233.

STERNUM, in anatomy. See Anatomy, p. 175.

STERNUTATORY, a medicine proper to produce sneezing. Sternutatives are of two kinds, gentle and violent. Of the first kind are betony, fage, marjoram, tobacco, and the whole fashionable tribe of snuffs. Of the latter kind are euphorbium, white hellebore, pellitory, &c.

STETIN, a city and port-town of Germany, in the circle of Silesia, on the river Oder: E. long. 14° 50', N. lat. 53° 30'.

STEVENAGE, a market-town of Hertfordshire, situated thirty miles north of London, and ten north-west of Hertford.

STEW, a small kind of fish-pond, the peculiar office of which is to maintain fish, and keep them in readiness for the daily use of the family, &c.

STEW, were also places anciently permitted in England to women of professed incontinency, for the proffer of their bodies to all comers. These were under particular rules and laws of discipline, appointed by the lord of the manor.

STEWARD, an officer appointed in another's (lead or jurisdiction. Of these there are various kinds. The greatest officer under the crown is the lord high steward of the king's household, who is the chief officer of the kings court, has the care of the king's house, and authority over all the officers and servants of the household, except such as belong to the chapel, chamber, &c.

STEWART, in Scots law. See Law, Tit. iv. 5.

STEWARTIA, in botany, a genus of the monadelphia polyandria class. The calyx is simple; the stigma is quinquescid; the berry has five lobes, and one seed. There is but one species, a native of Virginia.

STID, in zoology. See Alauda.

STIPA in botany, a genus of the triandria digynia class. The calyx consists of two valves, containing one flower; the exterior valve of the corolla terminates in an awn; and it is jointed at the base. There are seven species, only one of them, viz. the pennastrum, or feather-grass, a native of Britain.

STIFEND, among the Romans, signified the same with stipendiatii, in the civil law, the act of stipulating, that is, of treating and concluding terms and conditions to be inferred in a contract. Stipulations were anciently performed at Rome, with abundance of ceremonies; the first whereof was, that one party should interrogate, and the other answer, to give his consent, and oblige himself. By the ancient Roman law, no body could stipulate but for himself; but as the tabelliones were public servants, they were allowed to stipulate for their masters; and the notaries, succeeding the tabelliones, have inherited the same privilege.

STIRIA DUCHY, in Germany, is part of the circle of Austria.
STOCKTON, a port-town of Durham, situated near them in connection with the present article, the better to illustrate it.

STOCKPORT, a market-town of Cheshire, situated thirty-

STOCKING, that part of the clothing of the leg and

STOCKHOLM, the capital city of Sweden, situated on

Stock jobbing, the art or mystery of trafficking in the

STIRUP, in the manege, a rest, or support for the

STIRLNG, in gardening, the stem or trunk of a tree.

STIVES, the ancient Thebes, in the province of Achaia,

STIRUP of a ship, a piece of timber put upon a ship’s keel,

STIRRUP, in the manege, a rest, or support for the

STIRLING, a town of Scotland, capital of the county of

STOCK, in gardening, &c., the stem or trunk of a tree.

STOCKBRIDGE, a borough town of Hampshire, situated

STOCK COMPANY, and BANK, as it would be necessary to resume

STOCKS or PUBLIC FUNDS in England. As there are few

* Of these a general account only was given under the words COMPANY, and BANK, as it would be necessary to resume

The method of depositing money in the bank, and exchanging it for notes (though they bear no interest) is attended with many conveniences; as they are not only safer than money in the hands of the owner himself, but as the notes are more portable and capable of a much more easy conveyance; since a bank note for a very large sum may be sent by the post, and, to prevent the designs of robbers, may, without damage, be cut in two, and sent at two or three different times.

STOCK-BROKER. See Broker, and the next article.

STOCK-JOBBING, the art or mystery of trafficking in the

STOCKSMAN, a man who works in the stockyards, &c.,

STOCKS of the flocks, and a short history of the several companies*, describing the nature of their separate funds, the

In order to have a clear idea of the money-transactions of the several companies, it is necessary to know something of money in general, and the difference between that and the current species. See the article Money.

Money is the standard of the value of all the necessities and accommodations of life; and paper money is the representative of that standard to such a degree, as to supply its place, and to answer all the purposes of gold and silver coin. Nothing is necessary to make this representative of money supply the place of species, but the credit of that office or company who delivers it. which credit consists in its always being ready to turn it into species whenever required. This is exactly the case of the Bank of England; the notes of this company are of the same value as the current coin, as they may be turned into it whenever the possessor pleases. From hence, as notes are a kind of money, the counterfeiting them is punisheil with death as well as coining.

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The method of depositing money in the bank, and exchanging it for notes (though they bear no interest) is attended with many conveniences; as they are not only safer than money in the hands of the owner himself, but as the notes are more portable and capable of a much more easy conveyance; since a bank note for a very large sum may be sent by the post, and, to prevent the designs of robbers, may, without damage, be cut in two, and sent at two or three different times. Or bills, called bank post-bills, may be had by application at the bank, which are particularly calculated to prevent losses by robberies, they being made payable to the order of the person who takes them out at a certain number of days after sight; which gives an opportunity to stop bills at the bank if they should be lost, and prevents their being so easily negotiated by strangers as common bank notes are: and whoever considers the hazard, the expense and trouble there would be in sending large sums of gold and silver to and from distant places, must also consider this as a very singular advantage. Befide which, another benefit attends them; for if they are destroyed by time, or other accidents, the bank will, on oath being made of such accident, and security being given, pay the money to the person who was in possession of them.

Bank notes differ from all kinds of stock in these three particulars. 1. They are always of the same value. 2. They are paid off without being transferred; and, 3. They bear no interest; while stocks are a share in a company’s funds, bought without any condition of having the principal returned. India bonds indeed (by some persons, tho’ erroneously, denominated stock) are to be excepted; they being made payable at six months notice, either on the side of the company or of the possessor.

Stocks of the flocks, and a short history of the several companies*, describing the nature of their separate funds, the

* Of these a general account only was given under the words COMPANY, and BANK, as it would be necessary to resume them in connection with the present article, the better to illustrate it.
ployed. But this term has been extended farther, though improperly, to signify any sum of money which has been lent to the government, on condition of receiving a certain interest till the money is repaid, and which makes a part of the national debt. As the security both of the government and of the public companies is esteemed preferable to that of any private person, as the flocks are negotiable and may be sold at any time, and as the interest is always punctually paid when due; so they are thereby enabled to borrow money on a lower interest than what could be obtained from lending it to private persons, where there must be always some danger of losing both principal and interest.

But every capital flock or fund of a company is raised for a particular purpose, and limited by parliament to a certain sum, it necessarily follows, that when that fund is completed, no flock can be bought of the company; though shares already purchased may be transferred from one person to another. This being the case, there is frequently a great disproportion between the original value of the shares, and what is given for them when transferred; for, if there are more buyers than sellers, a person who is indifferent about selling will not part with his share without a considerable profit to himself; and, on the contrary, if many are disposed to sell, and few inclined to buy, the value of such shares will naturally fall, in proportion to the impatience of those who want to turn their flock into specie.

These observations may serve to give our readers some idea of the nature of that unjustifiable and dishonest practice called flock jobbing, the mystery of which consists in nothing more than this: The persons concerned in that practice, who are denominated flock-jobbers, make contracts to buy or sell, at a certain distant time, a certain quantity of some particular flock, against which time they endeavour, according as their contract is, either to raise or lower such flock, by raising rumours and spreading fictitious stories in order to induce people either to sell out in a hurry, and consequently cheap, if they are to deliver flock, or to become unwilling to sell, and consequently to make it dearer, if they are to receive flock.

The persons who make these contracts are not in general possessed of any real flock; and when the time comes that they are to receive or deliver the quantity they have contracted for, they only pay such a sum of money as makes the difference between the price the flock was at when they made the contract, and the price it happens to be at when the contract is fulfilled; and it is no uncommon thing for persons not worth 100 l. to make contracts for the buying or selling 100,000 l. flock. In the language of Exchange Alley, the buyer in this case is called the Bull, and the seller the Bear.

Besides these, there are another set of men, who, though of a higher rank, may properly enough come under the same denomination. These are your great monied men, who are dealers in flock and contractors with the government whenever any new money is to be borrowed. These indeed are not fictitious, but real buyers and sellers of flock; but by raising false hopes, or creating groundless fears, by pretending to buy or sell large quantities of flock on sudden, by using the fore-mentioned set of men as their instruments, and other like practices, are enabled to raise or lower the flocks one or two per cent. at pleasure.

However, the real value of one flock above another, on account of its being more profitable to the proprietors, or any thing that will really, or only in imagination, affect the credit of a company, or endanger the government, by which that credit is secured, must naturally have a considerable effect on the flocks. Thus, with respect to the interest of the proprietors, a share in the flock of a trading company which produces 5 l. or 6 l. per cent. per ann. must be more valuable than an annuity with government security, that produces no more than 3 l. or 4 l. per cent. per annum; and consequently such flock must fall at a higher price than such an annuity. Though it must be observed, that a share in the flock of a trading company producing 5 l. or 6 l. per cent. per annum, will not fetch so much money at market as a government annuity producing the same sum; because the security of the company is not reckoned equal to that of the government, and the continuance of their paying so much per annum is more precarious, as their dividend is, or ought to be, always in proportion to the profits of their trade.

As the flocks of the East India, the bank, and South-Sea companies, are distinguished by different denominations, and are of a very different nature, we shall give a short history of each of them, together with an account of the different flocks each is possessed of; beginning with the East India company, as the first established.

Of the East India Company.

There is no trading company in Europe, the Dutch East India company excepted, which can be put in competition with this. Its was first established in the latter end of the reign of queen Elizabeth; and its privileges have been enlarged, or confirmed, by almost every monarch since. Its shares, or subscriptions, were originally only 50 l. sterling; and its capital only 360,891 l. 5 s. but the directors having a considerable dividend to make in 1676, it was agreed to join the profits to the capital, by which the shares were doubled, and consequently each became of 100 l. value, and the capital 739,781 l. 10 s.; to which capital, if 663,639 l. the profits of the company to the year 1685, be added, the whole flock will be found to be 1,703,492 l.

However, this company having sustained several losses by the Dutch, and the subjects of the great Mogul, was in a declining way at the Revolution, when the war with France reduced it so low, that it appearing scarcely possibly to be supported, a new one was erected. The merchants forming the new East India company received their charter in 1698, having, in consideration of the grant thereof, lent the government two millions at 8 per cent. per annum; and publishing their trade with vigour, they soon carried on twice the business that was ever done by the old company. But after the two companies had subsisted a few years in separate state, means were contrived to unite them; which was effected in 1702, when a new charter was granted them under the title of the United Company of Merchants trading to the East Indies.

To the two millions advanced by the new company, the united company in the 6th of queen Anne lent the government 1,200,000 l., which made their whole loan amount to 3,200,000 l. A further sum was also lent by the company in 1730, on a renewal of their charter, the interest of which is reduced to 3 per cent., and called the India 3 per cent. annuities.

As to India flock, it is of a quite different nature; for as that is not money put out to interest, but the trading flock
flock of the company; and the proprietors of the shares, instead of receiving a regular annuity, have a dividend of the profit arising from the company's trade; which, as it is more valuable, these shares generally fell at a price much above the original value.

As to the management of this united company, all persons without exception, natives and foreigners, men and women, are admitted members of it, and 500 l. in the flock of the company gives the owner a vote in the general court, and 2000 l. qualifies him to be chosen a director. The directors are 24 in number, including the chairman, and deputy chairman, who may be re-elected for four years successively. The chairman has a salary of 200 l. a year, and each of the directors 150 l. The meetings or courts of directors are to be held at least once a-week; but are commonly oftener, being summoned as occasion requires.

Out of the body of directors are chosen several committees, who have the peculiar inspection of certain branches of the company's business; as the committee of correspondence, a committee of buying, a committee of treasurers, a committee of warehouses, a committee of shipping, a committee of accounts, a committee of law-suits, and a committee to prevent the growth of private trade, &c. who have under them a secretary, cashier, clerks, warehouse-keepers, &c.

Other officers of the company are governors and factors abroad; some of whom have guards of soldiers, and live in all the state of sovereign princes.

Of the Bank of England.

The company of the bank was incorporated by parliament, in the 5th and 6th years of king William and queen Mary, by the name of the Governor and Company of the Bank of England, in consideration of the loan of 1,200,000 l. granted to the government, for which the subscribers received almost 8 per cent. By this charter, the company are not to borrow under their common seal, unless by act of parliament; they are not to trade, or suffer any person in trust for them to trade in any goods or merchandise; but they may deal in bills of exchange, in buying or selling bullion, and foreign gold and silver coin, &c.

By an act of parliament passed in the 8th and 9th year of king William III. they were empowered to enlarge their capital flock to 2,200,171 l. 10 s. It was then also enacted, that bank-stock should be a personal, and not a real estate; that no contract either in word or writing, for buying or selling bank-stock, should be good in law, unless registered in the books of the bank within seven days, and the stock transferred in 14 days; and that it should be felony, without benefit of clergy, to counterfeit the common seal of the bank, or any sealed bank-bill, or any bank-note, or to alter or erase such bills or notes.

By another act passed in the 7th of queen Anne, the company were empowered to augment their capital to 4,402,343 l. and they then advanced 400,000 l. more to the government, and in 1714 they advanced another loan of 3,500,000 l.

In the third year of the reign of king George I. the interest of their capital flock was reduced to 5 per cent. when the bank agreed to deliver up as many exchequer-bills as amounted to 2,000,000 l. and to accept an annuity of 500,000 l. and it was declared lawful for the bank to call from their members, in proportion to their interests in the capital flock, such sums of money as in a general court should be found necessary. If any member should neglect to pay his share of the moneys so called for, at the time appointed by notice in the London Gazette, and fixed upon the Royal Exchange, it should be lawful for the bank not only to stop the dividend of such member, and to apply it toward payment of the money in question; but also to stop the transfers of the share of such defaulter, and to charge him with an interest of 5 l. per cent. per annum for the money so omitted to be paid; and if the principal and interest should be three months unpaid the bank should have power to sell so much of the stock belonging to the defaulter as would satisfy the same.

After this the bank reduced the interest of the 2,000,000 l. lent to the government from 5 to 4 per cent. and purchased several other annuities, which were afterward redeemed by the government, and the national debt due to the bank reduced to 1,600,000 l. But in 1742, the company engaged to supply the government with 1,600,000 l. at 3 per cent. which is now called the 3 per cent. annuities, so that the government was now indebted to the company 3,200,000 l. the one half carrying 4, and the other 3 per cent.

In the year 1746, the company agreed that the sum of 986,800 l. due to them in the exchequer-bills unsatisfied, on the duties for licences to sell spirituous liquors by retail, should be cancelled, and in lieu thereof to accept of an annuity of 39,442 l. the interest of that sum at 4 per cent. The company also agreed to advance the further sum of 1,000,000 l. into the exchequer, upon the credit of the duties arising by the malt and land tax, at 4 per cent. for exchequer-bills to be issued for that purpose; in consideration of which, the company were enabled to augment their capital with 986,800 l. the interest of which, as well as that of the other annuities, was reduced to 3 l. 10 s. per cent. till the 25th of December 1757, and from that time to carry only 3 per cent.

And in order to enable them to circulate the said exchequer bills, they established what is now called bank circulation: the nature of which not being well understood, we shall take the liberty to be a little more particular in its explanation than we have been with regard to the other stocks.

The company of the bank are obliged to keep cash sufficient to answer not only the common, but also any extraordinary demand that may be made upon them; and whatever money they have by them, over and above the sum supposed necessary for these purposes, they employ in what may be called the trade of the company; that is to say, in discounting bills of exchange, in buying of gold and silver, and in government securities, &c. But when the bank entered into the above mentioned contract, as they did not keep unemployed a larger sum of money than what they deemed necessary to answer their ordinary and extraordinary demands, they could not conveniently take out of their current cash so large a sum as a million, with which they were obliged to furnish the government, without either lessening that sum they employed in discounting, buying gold and silver, &c. (which would have been very disadvantageous to them,) or inventing some method that should answer all the purposes of keeping the million in cash. The method which
which they chose, and which fully answers their end, was as follows.

They opened a subscription, which they renew annually, for a million of money; wherein the subscribers advance 4½ per cent, and enter into a contract to pay the remainder, or any part thereof, whenever the bank shall call upon them, under the penalty of forfeiting the 10 per cent. so advanced; in consideration of which, the bank pays the subscribers 4 per cent. interest for the money paid in, and ¾ per cent. for the whole sum they agree to furnish; and in case a call should be made upon them for the whole, or any part thereof the bank farther agrees to pay them at the rate of 5 per cent. per annum for such sum till they repay it, which they are under an obligation to do at the end of the year. By this means the bank obtains all the purposes of the case, receiving 6 per cent, for the money they advance, yet the company gains the sum of 23,500 l. per annum by the contract; as will appear by the following account.

The bank receives from the government for the advance of a million £ 30,000
The bank pays to the subscribers who advance 100,000 l. and engage to pay (when called for) 900,000 l. more — — 6,500

The clear gain to the bank therefore is 23,500

This is the state of the case, provided the company should make no call on the subscribers: which they will be very unwilling to do, because it would not only lessen their profit, but affect the public credit in general.

Bank-stock may not improperly be called a trading stock, since with this they deal very largely in foreign gold and silver, in discounting bills of exchange, &c. Beside which, they are allowed by the government very considerable sums annually for the management of the annuities paid at their office. All which advantages render a share in their stock very valuable, though it is not equal in value to the East India stock. The company make dividends of the profits half-yearly, of which notice is publicly given when those who have occasion for their money may readily receive it; but private persons, if they judge convenient, are permitted to continue their funds, and to have their interest added to the principal.

This company is under the direction of a governor, deputy-governor, and 24 directors, who are annually elected by the general court, in the same manner as in the East India company. Thirteen, or more, compose a court of directors for managing the affairs of the company.

The officers of this company are very numerous.

Of the South-Sea Company.

During the long war with France in the reign of queen Anne, the payment of the sailors of the royal navy being neglected, and they receiving tickets instead of money, were frequently obliged by their necessities to sell these tickets to various men at a discount of 40 l. and sometimes 50 l. per cent. By this and other means the debts of the nation unprovided for by parliament, and which amounted to 9,471,321 l. fell into the hands of these sufferers. On which, Mr Harley, at that time chancellor of the exchequer, and afterward earl of Oxford, proposed a scheme to allow the proprietors of these debts and deficiencies 6½ per cent. per annum, and to incorporate them in order to their carrying on a trade to the South Seas; and they were accordingly incorporated under the title of the Governor and Company of Merchants of Great Britain trading to the South-Sea and other parts of America, and for encouraging the Fishery, &c.

Though this company seemed formed for the sake of commerce, it is certain the ministry never thought seriously, during the course of the war, about making any settlements on the coast of South America, which was what flattered the expectations of the people; nor was it indeed ever carried into execution, or any trade ever undertaken by this company, except the Affiento, in pursuance of the treaty of Utrecht, for furnishing the Spaniards with negroes, of which this company was deprived by the late convention between the courts of Great Britain and Spain, soon after the treaty of Aix-la-Chapelle in 1748.

After this, some other sums were lent to the government in the reign of queen Anne at 6 per cent. In the third of George I., the interest of the whole was reduced to 5 per cent. and they advanced two millions more to the government at the same interest. By the statute of the 6th of George I., it was declared that this company might redeem all or any of the redeemable national debts, in consideration of which the company were empowered to augment their capital according to the sums they should discharge: and for enabling the company to raise such sums for purchasing annuities, exchanging for ready money new exchequer-bills, carrying on their trade &c. the company might, by such means as they should think proper, raise such sums of money as in a general court of the company should be judged necessary.

The company were also empowered to raise money on contracts, bills, bonds, or obligations under their common seal, on the credit of their capital stock. But if the sub-governor, deputy-governor, or other members of the company, should purchase lands or revenues of the crown upon account of the corporation, or lend money by loan or anticipation on any branch of the revenue, other than such part only on which a credit of loan was granted by parliament, such sub-governor, or other member of the company, should forfeit treble the value of the money so lent.

The fatal South Sea scheme, transacted in the year 1720, was executed upon the last mentioned statute. The company had at first set out with good success, and the value of their stock for the first five years had risen faster than that of any other company; and his Majesty, after purchasing 10,000 l. stock, had condescended to be their governor. Things were in this situation, when, taking advantage of the above statute, the South Sea bubble was projected. The pretended design of which was to raise a fund for carrying on a trade to the South Seas, and purchasing annuities, &c. paid to the other companies; and propostals were printed and distributed, shewing the advantages of the design, and inviting persons into it. The fund necessary for carrying it on, together with the profits that were to arise from it, were divided into a certain number of shares, or subscriptions, to be purchased by persons disposed to adventure therein. And the better to carry on the deception, the directors engaged to make very large dividends, and actually declared, that every 100 l. original stock would yield 50 l. per annum, which occasioned so great a rise of their stock, that a share of 100 l. was sold for upward of 1000 l. This was
in the month of July; but before the end of September it fell to £150 by which multitudes were ruined, and such a scene of distress occasioned as is scarcely to be conceived. But the consequences of this infamous scheme are too well known. We shall pass over all the other transactions of this company in the reign of King George I, as not material to our present purpose.

By a statute of the 6th of his late Majesty, it was enacted that from and after the 24th of June 1733, the capital stock of this company, which amounted to 14,651,103 l. 8s. v.d. and the shares of the respective proprietors, should be divided into four equal parts; three-fourths of which should be converted into a joint stock; attended with annuities, after the rate of 4 per cent. until redemption by parliament, and should be called The new South Sea annuities; and the other fourth part should remain in the company as a trading capital stock, attended with the residue of the annuities or funds payable at the exchequer to the company for their whole capital, till redemption; and attended with the same sums allowed for charges of management, and with all effects, profits of trade, debts, privileges and advantages belonging to the South Sea company. That the accomplishment of the company should twice every year, at Christmas and midsummer, or within one month after, state an account of the company's affairs, which should be laid before the next general court, in order to their declaring a dividend; and all dividends should be made out of the clear profits, and should not exceed what the company might reasonably divide without incurring any further debt; provided that the company should not at any time divide more than 4 per cent. per annum, until their debts were discharged; and that the South Sea company, and their trading stock, should, exclusively from the new joint annuities, be liable to all the debts and incumbrances of the company; and that the company should cause to be kept within the city of London, an office and books, in which all transfers of the new annuities shall be entered and signed by the party making such transfer, or his attorney; and the person to whom such transfer should be made, or his attorney, should underwrite his acceptance, and no other method of transferring the annuities should be good in law.

The annuities of this company, as well as the other, are now reduced to 3 per cent. This company is under the direction of a governor, sub-governor, deputy governor, and 21 directors; but no person is qualified to be governor, his Majesty excepted, unless such governor has, in his own name and right, 5000 l. in the trading stock; the sub-governor is to have 4000 l. the deputy 3000 l. and a director 2000 l. in the same stock. In every general court, every member having in his own name and right 500 l. in trading stock, has one vote; if 2000 l. two votes; if 3000 l. three votes; and if 5000 l. four votes.

The East India Company, the Bank of England, and the South Sea Company, are the only incorporated bodies to which the government is indebted, except the Million Bank, whose capital is only one million, constituted to purchase the reversions of the long exchequer-orders. The interest of all the debts owing by the government is now reduced to 3 per cent. excepting only the annuities for the years 1756 and 1758, the life-annuities, and the exchequer orders; but the South Sea company still continues to divide four per cent. on their present capital stock, which they are enabled to do from the profits they make on the

funds allowed to them for management of the annuities paid at their office, and from the interest of annuities which are not claimed by the proprietors.

As the prices of the different stocks are continually fluctuating above and below par; so when a person who is not acquainted with transactions of that nature, reads in the paper the prices of stocks, where bank-stock is marked perhaps 117 l. India ditto 134 a 134 l. South Sea ditto 97 l., & c. he is to understand that a 100 l. of those respective stocks fell at such a time for those several sums.

In comparing the prices of the different stocks one with another, it must be remembered, that the interest due on them from the time of the last payment, is taken into the current price; and the seller never receives any separate consideration for it, except in the case of India bonds, where the interest due is calculated to the day of the sale, and paid by the purchaser over and above the premium agreed for. But as the interest on the different stocks is paid at different times, this, if not rightly understood, would lead a person not well acquainted with them into considerable mistakes in his computation of their value; some always having a quarter's interest due on them more than others, which makes an appearance of a considerable difference in the price, when in reality there is none at all. Thus, for instance, old South Sea annuities fell at present for £85 or £85 10s. while new South Sea annuities fetch only £84 2s. or £84 15s. though each of them produce the same annual sum of £3 per cent. but the old annuities have a quarter's interest more due on them than the new annuities, which amounts to £1 s. the exact difference. There is, however, one or two cautions that will always make one species of annuities fell somewhat lower than another, though of the same real value; one of which is, the annuities making a small capital, and there not being for that reason so many people at all times ready to buy into it as into others where the quantity is larger; because it is apprehended, that whenever the government pays off the national debt, they will begin with that particular species of annuity the capital of which is the smallest.

A stock may likewise be affected by the court of chancery; for if that court should order the money which is under their direction to be laid out in any particular stock, that stock, by having more purchasers, will be raised to a higher price than any other of the like value.

By what has been said, the reader will perceive how much the credit and interest of the nation depends on the support of the public funds. While the annuities, and interest for money advanced, is there regularly paid, and the principal insured by both prince and people (a security not to be had in other nations) foreigners will lend us their property, and all Europe be interested in our welfare; the paper of the companies will be converted into money and merchandise, and Great Britain can never want cash to carry her schemes into execution.

In other nations, credit is founded on the word of the prince, if a monarchy; or that of the people, if a republic; but here, it is established on the interests of both prince and people; which is the strongest security; for however lovely and engaging honestly may be in other respects, interest in money-matters will always obtain confidence; because many people pay great regard to their interest, who have but little veneration for virtue.
STOICS, a faction of ancient philosophers, the followers of
Zeno, thus called from the Greek stoa, which signifies a
porch or portico, in regard Zeno used to teach under a
porch or piazza.

To the praise of the Stoics in general, it must be con-
fessed, that, less intent than other philosophers upon tri-
volution and often dangerous speculations, they devoted
their studies to the clearing up of those great principles
of morality which were the firmest supports of society;
but the dryness and stiffness that prevailed in their writ-
ings, as well as in their manners, disfigured most of their
readers, and abundantly lessened their utility. Zeno's chief
followers, among the Greeks, were Lucippus, Cleanthes,
Chryssippus, Diogenes Babylonius, Antipater, Panmortius,
Pomponius, and Epicurus; among the Romans, Cato,
Varro, Cicero, Seneca, the emperor Antoninus, &c. The
Stoics cultivated logic, physics, metaphysics, &c. but especi-
ely ethics. The principles of their dogmata, of the former
kinds, are, that there are certain cataleptias or comprehen-
sions, called innate ideas or principles, naturally found in
the mind; that God is the causal cause of the universe;
and, with the Platonists, that the world is an animal, by
reason of God's inhabiting and informing every part there-
of; that nature is an artificial fire tending to generation;
and that the world is at last to be destroyed by a con-
futation. As for the morality of the Stoics, it was couched
much in paradoxes; as, that a wise man is void of all pas-
sions, or perturbation of mind; that pain is no real evil, but
that a wise man is happy in the midst of torture, is al-
ways the same, and is always joyful; that there is none el-
se ought to be esteemed king, magistrate, poet, or philo-
osopher; that all wise men are great
men; that they are the only friends or lovers; that no-
thing can happen to them beyond their expectations; that
all virtues are inextricably connected together; that all good
things are equal, and equally to be desired; that good-
ness admits of no increase or diminution. They own but
one God, whom they however call by various names,
as Fate, Jupiter, &c. by which they did not mean vari-
ous things, but various powers and relations of the same
thing. Providence they expressed under the name Fate,
which Chryssippus defines to be a natural series or com-
position of things mutually following each other, by an
immutable nexus or tie, fixed from all eternity. They
held the immortality of the soul.

STOKEGOMER, a market-town of Somerfetshire, situ-
tated twenty-two miles west of Wells.

STOKESLY, a market-town of Yorkshire, situated thirty
miles north of York.

STOLBERG, a town of Germany, in the circle of Upper
Saxony, and territory of Thuringia, fifty-eight miles
north-west of Leipzig.

STOLE, a sacerdotal ornament worn by the Roman parlia-
priests over their surplice, as a mark of superiority in
their respective churches; and by other priests, over the
als, at celebrating of mass, in which case it goes a-cros-
the stomach, and by deacons, over the left shoulder,
scarf-wipe; when the priest reads the gospel for any one,
he lays the bottom of his stole on his head. The stole
is a broad swath, or flap of stuff, hanging from the neck
to the feet, with three croffes thereon.

Groom of the Stole, the eldest gentleman of his Majesties
bed chamber, whose office and honour it is to present
and put on his majesty's first garment, or shirt, every
morning, and to order the things in the chamber.

Order of the Stole, an order of knights instituted by the
kings of Arragon. Another military order, at Venice,
is called the order of the golden stole; thus called from
a golden stole, which those knights wore over their
shoulder, reaching to the knee, both before and behind,
and a half broad. None are raised to this order
but patricians, or noble Venetians.

STOMACH, in anatomy. See Anatomy, p. 258.

STOMACHIC, in pharmacy, medicines that strengthen
the stomach, and promote digestion, &c.

Stomachic corrobatives are such as strengthen the
tone of the stomach and intestines; among which are car-
minatives, as the roots of galangals, red gentian, zedoary,
pimpinella, calamus, aromaticus, and arum. Of barks
and rhinds, those of canella alba, ladafras, citrons, Seville
and China oranges, &c. Of spices, pepper, ginger,
cloves, cinnamon, cardamums, and mace.

STONES, in natural history, are defined to be essen-
tially compound foillis, not inflammable, nor soluble in water
or oil, nor at all ductile; found in continued strata, or beds,
of great extent; formed either of a congeries of small par-
ticles, in some degree resembling sand, and lodged in a smoo-
other cementitious matter; or else of this cementitious matter,
and the grit or sand-like particles, running together into
one smooth mass; or, finally, of granules cohering by con-
tact, without any cementitious matter among them; or com-
pounded of crytall or spar, usually debased by earth, and often
mixed with talc and other extraneous particles.

Of this class of foillis there are three orders; and un-
der these, eight genera.

The first order comprehends all the coarse, harsh, and
rough stones, of a lax texture, and composed of a visible
gritt, resembling sand in form, and usually immersed in
a cementitious matter, and of little natural brightenes;
scarce capable of any polish, and naturally mouldering
away in form of powder from the tools of the workmen.
The genera of this order are two, viz. the ammochida
and platanus; the former of which constitute our grey
and rough flates; and the latter comprehends most of the
stones used in building, particularly Portland stone.

The second order consists of stones moderately fine,
of a more compact and even texture, scarce dilligenu-
ble contruction, and affording no sand-like particles to
the view: of some natural brightenes, capable of a toler-
able polish, and flying off from the tools of the workmen
in form of small chips. Under this order are comprre-
hended the sympexia and degania.

The
The third order consists of flones of a very fine sub-
stance and elegant structure; naturally of a great bright-
ness, and capable of an elegant polish; composed of
granules of various shapes and sizes, but usually flattish,
sometimes more, sometimes less distinct; and, in some
species, running together into uniform masses, but never
lodged in any cementitious substance. Of this order are
the marbles, alabaster, porphyries, and granites.

Stone in the bladder. See Medicine, and Surgery.
Stone also denotes a certain quantity or weight of some
commodities.

A flone of beef, at London, is the quantity of eight
pounds: in Hertfordshire, twelve pounds; in Scotland,
sixteen pounds.

Stone chatter, in ornithology. See Motacilla.

Stonechenge, in antiquity. A famed pile or monu-
ment of huge flones on Salisbury plain, fix miles distant
from that city.

It consists of the remains of four ranks of rough flones,
ranged one within another, some of them, especially in
the outernot and third rank, twenty feet high, and
seven broad; sustaining others laid across their heads,
and fastened by mortises; so that the whole must have
anciently hung together.

Antiquaries are now pretty well agreed that it was a
British temple; and Dr Langwith thinks it might easily
be made probable, at least, that it was dedicated to the
sun and moon. Inigo Jones has given a fine scheme of
the work, and strives hard to persuade the world, that
it was Roman: but Dr Langwith, who took his mea-
sures on the spot, assures us he could by no means reco-

ncile them with that scheme.

Stoney-stratford, a market-town of Buckingham-
shire, fourteen miles north of Ailebury.

Stool, in medicine, an evacuation or discharge of the
faeces, &c. by the anus.

Stopper, in a ship, a piece of cable-laid rope, having a
wale-knot at one end, with a laniard fastened to it; and
the other end is spliced round a thimble in the ring-bolts
upon deck, and at the bits: its use is to stop the cable,
that it may not run out too fast; in order to which, they
make turns with the laniard about the cable, and the wale-
knot floats it, so that it cannot float away faster than is
necessary.

Storax, or Styrax, in natural history, a dry and solid
resin, of a reddish colour, and a peculiarly fragrant smell;
of which there are two kinds, the Styrax calamita, or
Styrax in tears, and the Styrax vulgaris; whereas the for-
mer is by far the purer and finer kind, imported in stariall
granules: it anciently used to be packed up in reeds, for

not formed of granules, but of one uniform consistence.

These are the two genuine kinds of storax; but nei-
ther of them is that met with in our shops, which is a
kind of saw-dust composed into lumps, by which so much of
the storax resin as will make the other matters hang
together. This is what our apothecaries use, under the
name of storax; but it is advisable to strain carefully
the pure resin from the fifth, and use no part of the latter.

The two genuine kinds of storax, which ought always
Vol. III. No 95.
STRAIT, is a narrow passage out of one sea into another.

STRABISMUS, squinting, a distortion of the eyes, whereby their pupils are turned from, instead of being directed toward objects at which they look: sometimes only one eye, but more frequently both are thus affected. See Medicine, p. 155.

STRAIN, in surgery, a violent extension of the sinews, or tendons, of some muscle.

STRAIT, is a narrow passage out of one sea into another, as those of Gibraltar and Magellan.

STRADES, in the sea-language, signify the uniform ranges of planks on the bottom, decks, and sides of ships; and the garboard-strake is that next the keel.

STRALSUND, a strong city and port-town of Germany, in the circle of Upper Saxony and duchy of Pomerania, subject to Sweden: E. long. 13° 22', and N lat. 54° 23'.

STRAND, signifies any shore of the sea, or bank of a great river; hence an immunity from paying customs on goods or vessels, was anciently expressed by strand and stream.

STRANDED, among seamen, is said of a ship that is driven ashore by a tempest, or runs on ground through ill fortune, and so perishes.

STRANGFORD, a town of Ireland, that gives name to a loch and bay in the county of Down and province of Ulster, situated nine miles east of Down.

STRANGURY, in medicine, a suppression of urine. See Medicine, p. 160.

STRAPADO, a kind of military punishment, wherein the criminal is hoisted up by a rope, and let down, so that, by the weight of his body in the fall, his arms are dislocated.

STRAPARS, or a saddle, are strong leather-thongs, nailed to the bows of a saddle, in order to make the girths, &c.

STRAPPY, among seamen, is said of a ship that is driven ashore by a tempest, or runs on ground through ill fortune, and so perishes.

STRASBURG, a free imperial city of Germany, capital of the landgraviate of Alsace, situated near the western bank of the Rhine, in E. long. 7° 35', and N lat. 48° 38'.

STRATA, in natural history, the several beds or layers of the earth, or bank of a great river; hence an immunity from paying customs on goods or vessels, was anciently expressed by strand and stream.

The time when these several strata were laid, was doubtfule at the creation: unless, with some great naturalists, as Steno, Dr. Woodward, &c. we suppose the globe of the earth to have been disfolded by the deluge.

STRATAGEM, in the art of war, any device for the deceiving and surprizing an enemy.

STRATEGUS, in Grecian antiquity, an annual officer among the Athenians, whereof there were two chosen, to command the troops of the flate.

STRATFORD, a populous market-town of Warwickshire, situated on the river Avon, six miles south of Warwick; remarkable for being the birth-place of the inimitable Shakespeare, and lately for the Jubilee held there in honour of his memory, September 1769.

STRATHNAVAY, a subdivision or district of the county of Sutherland, in Scotland, having the Caledonian ocean on the north and west.

STRATIFICATION, in chemistry, the ranging anything to be calcined in several layers or strata one above another.

STRATIOTES, in botany, a genus of the polyandra hexamyla class. The Ipomopsis conficts of two leaves, and the perianthium of three segments; the corolla has three petals, and the berry has six cells. There are two species, one of them, viz. the abores, water-aloe, or fresh-water lodd, a native of Britain.

STRATTON, a market-town of Cornwall, situated a little south of the Bristol channel, fourteen miles north-west of Launceston.

STRAWBERRY, in botany. See Fragaria.

STRAWBERRY TREE, in botany. See Arbutus.

STRENGTH, in physiology, the same with force, power.

STRENGTHENERS, in pharmacy, medicines that add to the bulk and firmness of the foIius; and such are all absorbent, agglutinant, and altringent medicines.

STRIE, in the ancient architecture, the same with the flutings of columns. See Flutes.

STRIATED LEAF, among botanists, one that has a number of longitudinal narrows on its surface.

STRIGONENSIS TERRA, earth of Strigonium, in the materia medica, a red earth, of the bole kind, found about the gold-mines at Strigonium in Hungary, and used in some places as an altringent and sudorific.

It is but of a coarse and impure texture, and lighter than most of the boles in colour; it is of a strong, dull red, and is of a tolerably smooth surface; it is apt to crumble to pieces between the fingers, and stains the skin in handling; it melts freely in the mouth, and has a remarkable smoothness, but very little altringency in its taste, and leaves a sensible grittiness between the teeth; it is sometimes veined and spotted with small molecules of an earth, like the whitish variegations of the red French bole.

STRIE, a measure of capacity, containing four bushels.

STRIE, among seamen, is a word variously used: when a ship, in a fight, or on meeting with a ship of war, sets down or lowers her top-sails, at least half-mast high, they say she strikes, meaning she yields, or submits, or pays respect to the ship of war. Also, when a ship touches ground, in shoal-water, they say she strikes. And, when a top-mast is to be taken down, the word of command is, Strike the top-mast, &c.

STRIX, in ornithology, a genus belonging to the order of accipitres. The bill is hooked, but has no cere or wax; the nostrils are covered with tereaceous leathers; the head is very large, as are also the ears and eyes; and the tongue is bent. There are twelve species, comprehending all the owl-kind. They are night-birds, and feed upon mice, bats, &c.

STROBILUS, among botanists. See Botany, p. 637.

STROMATEUS, in ichthyology, a genus belonging to the order of apodes. The head is compressed, the teeth in the jaws and palate; the body is oval, and slimy; and the tail is forked. There are two species.

STROMBOLI, one of the Lipari islands, fifty miles north of Messina.

STRONGOLI, a town of the Hither Calabria, in the kingdom of Naples, situated on the gulf of Taranto.

STROPE, in ancient poetry, a certain number of verses, including a perfect enjambement and making the first part of an ode.

STROUD, a market-town, nine miles south of Gloucester.
STYLE, in jurisprudence, the particular form or manner of proceeding in each court of jurisdiction, agreeable to the rules and orders established therein: thus we say the style of the court of Rome, of Chancery, of Parliament, of the Privy council, &c.

Old Style, the Julian manner of computing time, as the New Style is the Gregorian method of computation. See Astronomy, p. 490.

STYLET, a small dangerous kind of pox, which may be concealed in the hand, chiefly used in treacherous affimilations. The blade is usually triangular, and so slender that the wound it makes is almost imperceptible.

STYLITES, an appellation given to a kind of solitaries, who spend their lives seated on the tops of columns, to be, as they imagine, the better disposed for meditation, and even as low as the eleventh century. The founder of the order was St. Simon Stylites, a famous anchorite in the fifth century, who took up his abode on a column six cubits high; then on a second, of twelve cubits; and, at last, on another of thirty-six. The extremity of these columns were only three feet in diameter, with a kind of rail or ledge about it that reached almost to the girdle, somewhat resembling a pulpit. There was no lying down in it. The faqirs, or devout people of the East, imitate this extraordinary kind of life even to this day.

STYLOGLOSSUS, in anatomy. See Anatomy, p. 304.

STYLOHYOID, in anatomy. See Anatomy, p. 304.


STYLOGLOSSUS, in anatomy. See Anatomy, p. 304.

STYLOGLOSSUS, in anatomy. See Anatomy, p. 304.

STYLOGLOSSUS, in anatomy. See Anatomy, p. 304.

STYLOPHARYNGEUS, in anatomy. See Anatomy, p. 304.

STYLOGLOSSUS, in anatomy. See Anatomy, p. 304.

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STYLOGLOSSUS, in anatomy. See Anatomy, p. 304.

STYLOGLOSSUS, in anatomy. See Anatomy, p. 304.
SUBMISSION, in Scots law. See Law, Tit. xxxii, 15.
SUBORDINATION, a relative term, expressing the degree of inferiority between one thing and another.
SUBORNATION of perjury, in Scots law. See Law, Tit. xxxiii, 55.
SUBPOENA, in law, a writ whereby all common persons, or those under the degree of peerage, may be called into chancery, in any case where the law cannot afford a remedy.
SUBREPTION, the act of obtaining a favour from a superior, by surplice or a false representation.
SUBREPTITIOUS, a term applied to a letter, licence, patent, or other act, fraudulently obtained of a superior, by concealing some truth, which, had it been known, would have prevented the concession or grant.
SUBROGATION, in the civil law, the act of substituting a person in the place, and entitling him to the rights of another.
SUBSCAPULARIS, in anatomy. See Anatomy, p. 156.
SUBSCRIPTION, in general, signifies the signature put at the bottom of a letter, writing, or instrument.
SUBSEQUENT, something that comes after another, particularly with regard to the order of time.
SUBSIDY, in law, signifies an aid or tax granted to the king, by parliament, for the necessary occasions of the kingdom; and is to be levied on every subject of ability, according to the rate or value of his lands or goods: but this word, in some of our statutes, is confounded with that of customs.
SUBSISTENCE, in the military art, is the money paid to the soldiers weekly, not amounting to their full pay; because their clothes, accoutrements, tents, bread, &c. are to be paid.
SUBSTANCE, something that we conceive to subsist of itself, independently of any created being, or any particular mode or accidents. See Metaphysics.
SUBSTANTIAL, in the schools, something belonging to the nature of subsistance.
SUBSTANTIVE, in grammar. See Grammar.
SUBSTITUTE, a person appointed to officiate for another, in case of absence or other legal impediment.
SUBSTITUTION, in the civil-law, a disposition of a testament, whereby the testator substitutes one heir for another, who has only the usufruit, and not the property of the thing left him.
SUBTRACTION, in arithmetic. See Arithmetic, p. 370.
SUBTRACTION, in algebra. See Algebra, p. 81.
SUBTENSE, in geometry, the same with the chord of an angle.
SUBSTRACTION, in arithmetick. See Arithmetic, p. 161. and Saccharum.
SUBTILE, in physics, an appellation given to whatever is extremely small, fine, and delicate; such as the animal spirits, the effluvia of odorous bodies, &c. are supposed to be.
SUBULARIA, in botany, a genus of the tetradyndromia filiculofa class. The pod is entire, oval, with oval concave valves; and the stylus is shorter than the pod. There is but one species, viz. the aquatica, or awl-wort, a native of Britain.
SUBULATED, something in the shape of an awl.
SUCCEDEANUM, in pharmacy, denotes a drug subtilized in the place of another, in medical composition.
SUCCESSION, in philosophy, an idea which we get by reflecting on that train of ideas constantly following one another in our minds when awake.
SUCCESSION, in Scots law. See Law, Tit. xxvii, 1, &c. xxviii, 1, &c.
SUCCESSOR, in law, one that succeeds, or comes in the place of another.
SUCCE NUM, in natural history. See Amber.
SUCCE SIA, in botany. See Scabiosa.
SUC Cory, in botany. See Cichorium.
SUC Cousus, a term used by some imaginary writers, for a demon who assumes the shape of a woman, and as such lies with a man; in which sense it stands opposed to incubus, which was a demon in form of a man, that they supposed to lie with a woman.
SUCCKERS, in gardening, the same with off-sides. See Off-sets.
SUC TION, the act of sucking or drawing up a fluid, as air, water, milk, or the like, by means of the mouth and lungs. See Pneumatics, and Hydrostatics.
SUDATORY, a name given by the ancient Romans to their hot or sweating-rooms; sometimes also called laconica.
SUDBURY, a borough-town of Suffolk, thirteen miles south of Bury. It sends two members to parliament.
SUDORIFIC, an appellation given to any medicine that causes or promotes sweat.
SUEZ, a port-town of Egypt, situated at the bottom of the Red-sea, seventy miles east of Cairo: it is from this town that the isthmus of Suez, which joins Africa to Asia, takes its name.
SUFFOCATION, in medicine, the privation of respiration, or breathing; which is sometimes occasioned by a congestion of blood in the lungs, so as to prevent the ingress of the air.
SUFFOLK, a county of England, bounded by Norfolk on the north, by the German-sea on the east, by Essex, from which it is separated by the river Minestingtree, on the south, and by Cambridge-shire on the west; being sixty-two miles long, and twenty-eight broad.
SUFFRAGAN, an appellation given to bishops with respect to archbishops, on whom they depend, and to whom appeals lie from the bishops' courts.
SUFFRAGE, denotes a vote given in an assembly, where something is deliberated on, or where a person is elected to an office or benefit.
SUFFRUTEX, among botanists, denotes an under-shrub, or the lowest kind of woody plants, as lavender, rue, &c.
SUGAR, in natural history, is properly the essential salt of the sugar-cane, as tartar is of the grape. See Chemistry, p. 157.
flank, or cane, being round, jointed, and two or three inches in diameter at the bottom: the joints are three or four inches alunder, and in a rich foil more: the leaves are long and narrow, and of a yellowish green colour; as is also the flank itself, the top of which is ornamented with a panicule, or cluster of arundinaceus flowers, two or three feet in length.

They propagate the sugar-cane, by planting cuttings of it in the ground in furrows, dug parallel for that purpose; the cuttings are laid level and even, and are covered up with earth; they soon shoot out new plants from their roots or joints: the ground is to be kept clear, at times, from weeds; and the canes grow so quick, that in eight, ten, or twelve months, they are fit to cut for making of sugar from them. The manner of doing it is thus: They cut off the reeds at one of the joints near the roots; they are then cleared of the leaves, and tied up in bundles, and sent to the mills, which are worked either by water or horses.

The sugar-mill is composed of three rollers of an equal fize, and all armed with iron plates, where the canes are to pass between them; only the middle roller is much higher than the right, to give the larger sweep to the two poles to which the horfes are yoked. This great roller in the middle is furnished with a cog full of teeth, which catch the notches in the two side rollers, and force them about to bruise the cane, which passes quite round the great roller, and come out dry and squeezed from all their juice; which runs into a vessel or back under the mill, and is thence conveyed through a narrow spout into the first boiler.

After the juice is let out of the first vessel, it is received into another; in which it is boiled more briskly, and scummed from time to time with a large kind of spoon, pierced with holes to let the liquor through, while it retains the scum and foulnefs separated from it in boiling: towards the end of this boiling, they throw into it a strong lixivium of wood-afhes, with some quick lime among it: this greatly promotes the separation of the foulnefs that yet remains among it; and, after it has boiled some time with this addition, they strain it off. The faeces left in the cloths make a kind of wine, when fermenting properly with water. The strained liquor, which is now tolerably clean, is let into a third boiler, in which it is boiled down to the confidence of sugar over a very brisk fire, the people who attend it continually stirring and scumming it.

Great caution is to be used that the boiling matter does not rise over the sides of the vessel, which would be of very dangerous consequence: they prevent this by taking up quantities of the boiling matter with a ladle, lifting it up high, and letting it run in again, and by now and then adding a small piece of batter, or fat of some kind, which takes down the bubbling almost instantaneously. They are very careful that no lemon-juice, or any other acid of that kind, comes near the vessels, a very small admixture of that being sufficient to keep the matter from granulating. When the liquor is boiled enough, which is known by its concreting on throwing a spoonful of it up into the air, it is then let out into a fourth vessel, under which there is a very gentle fire, only kept up that it may have leisure to granulate; when it has begun to granulate, it is let out of this last boiler into a kind of conic earthen vessels, open at both ends; the widest aperture is placed upwards, and the smaller end downwards, its aperture being stopped with a wooden plug. It is left in these vessels twenty-four hours to concreted; after this they are removed into sugar-houses, and are there arranged in regular order, with a vessel of earthen-ware under each; the plug is then taken out of the bottom aperture of each, and they are left in this condition for about forty days, that all the thick liquor, or melafles, may run from them: after they have stood thus long to drain of themselves, a quantity of clay is diluted, with water, into a thin past; and this is poured on the top of every parcel of sugar in the vessels, so as to cover it two or three inches deep.

This water, by degrees, all leaves the clay, and penetrating into the mafs of sugar, runs through it, and carries off yet more of this foul thick liquid with it, into the vessels placed underneath to receive it.

When the clay is quite dry, it is taken off, and the first preparation of the sugar is now finished; they take it out of the vessels, and, cutting it into lumps, which are of a dirty, brownish, or greyish colour, they put it up in hoglheads, and other casks, under the name of grey or brown sugar. The sugar, in this state, ought to be dry, not unctuous, and to have no taste of burning. The liquor which has run from the sugar in standing, is boiled to a confidence, and sold under the name of melafles or treacle; this affords, by fermentation, a very clear and good spirit.

This coarse sugar is afterwards refined to various degrees of purity by new solutions, and is fold at different prices, and under different names, according to the degree of purity it is brought to. Our sugar refiners first dissolve it in water, then clarify the solution by boiling with whites of eggs and desphumation; and after due evaporation pour it into moulds; where the fluid part being drained off, and the sugar concreted, its surface is covered with moist clay, as before. The sugar thus once refined, by repetition of the process becomes the double-refined sugar of the shops. The candy-sugar, or that in crystals, is prepared by boiling down solutions of sugar to a certain pitch, and then removing them into a hot room, with flicks placed across the vessel for the sugar to shoot upon; and these crystals prove of a white or brown colour, according as the sugar used in the process was pure or impure.

SUGILLATION, in medicine, an extravasation of blood in the coats of the eye, which at first appears of a reddish colour, and afterwards livid or black. If the disorder is great, bleeding and purging are proper, as are diuretics.

SUIT, in law, is used in different senses: as, 1. For an action, whether personal or real. 2. Suit of court, or suit-service, which is an attendance the tenant owes to his lord's court. 3. Suit-covenant, where a person has covenanted to do service in the court of the lord. 4. Suit-custum, which is where one and his ancestors have owed suit time out of mind. 5. It is used for a petition to the king, or any person of dignity; where a lord disclaims his tenant for suit, and none is due; in this case, the party may have an attachment against him to appear in the king's court. 6. Suit of the king's peace, is an action brought against a person for breach of the king's peace; as in the case of treasons, felonies, or trespasses.
SULPHUR. See Chemistry, p. 72, 118.
SULTAN, a title of honour given to the emperor of the Turks. The wife of a sultan is called sultana, and the favourite one hafita-sultana, i. e. the private sultana.
SUM, signifies the quantity that arises from the addition of two or more magnitudes numbers, or quantities together. See Arithmetic.
SUMACH, in botany. See Rhus.
SUMATRA, an island in the East Indian ocean, situated between 96° and 106° E. long, and between 5° 30' N. lat. and 5° 30' S. lat. extending from north-west to south-east, nine hundred miles long, and from one hundred to one hundred and fifty broad.
SUMMARY, in matters of literature. See Abridgment.
SUMMIT, the top or vertex of any body, or figure; as of a triangle, cone, pyramid, &c.
SUMMONS, in Scots law. See Law, Tit. xxx. 28.
SUN, in astronomy. See Astronomy, p. 435.
Sun-flower in botany. See Helianthus.
SUNDA-ISLANDS, those situated near the Straits of Sunda, in the Indian ocean; the chief of which are Borneo, Java, Sumatra, &c. See Borneo, &c.
SUNDAY, or the Lord's-day, a solemn festival observed by Christians on the first day of every week, in memory of our Saviour's resurrection.
This is the principal and most noted of the Christian festivals, and was observed with great veneration in the ancient church, from the time of the apostles, who themselves are often said to have met on that day for divine service. It is likewise called the Sabbath-day, as being subsituted in the room of the Jewish sabbath. See Sabbath.
The ancients retained the name Sunday, or dies solis, in compliance with the ordinary forms of speech, the first day of the week being so called by the Romans, because it was dedicated to the worship of the sun.
SUNDERLAND a port-town of Durham, situated on the German sea, at the mouth of the river Wear, ten miles north-east of Durham city.
SUNTUGOW, a territory in the circle of the upper Rhine in Germany, bounded by Allace on the north, by the river Rhine, which divides it from the Brugow, on the east; by Swirgland on the south; and by France-Compte on the west.
SUOVETAURILIA, an ancient Roman sacrifice, so called because it consisted of a pig (fas), a sheep, or rather ram (baciga), and a bull (taurus). They were all males, to denote the masculine courage of the Roman people. It was likewise called solitaurilia, because the animals offered were always (falsa) whole or uncut.
SUPERCARGO, a person employed by merchants to go on a voyage, and oversee their cargo, or lading, and dispose of it to the best advantage.
SUPERCILIUM, in anatomy. See Anatomy, p. 294.
SUPERCROGATION, in theology, what a man does beyond his duty, or more than he was commanded to do.
SUPERNUMERARY, something over and above a fixed number. In several of the offices are supernumerary clerks, to be ready on extraordinary occasions.
SUPPLEMENT, in matters of literature, an appendage or addition, to supply what is wanting therein.
SUPERSTITION, extravagant devotion, or religion wrong directed or conducted.
SUPERVISOR, a surveyor or overseer.
SUPERSTITION, in anatomy, the action of a supinator muscle, or the motion whereby it turns the hand so as that the palm is lifted up towards heaven.
SUPPLEMENT, in matters of literature, an appendage to a book, to supply what is wanting therein.
SUPPRESSED, in heraldry, a term applied to the uppermost quarters of a shield when divided into several quarters, these seeming as it were supported or sustained by those below. The chief is said to be supported when it is of two colours, and the upper colour takes up two thirds of it. In this case it is supported by the colour underneath.
SUPPORTERS, in heraldry, figures in an achievement placed by the side of the shield, and seeming to support or hold up the same. Supporters are chiefly figures of beasts or figures of human creatures, for the like purpose, as properly called tenants.
SUPPOSITORY, a kind of medicated cone, or ball, which is introduced to the anus for opening the belly. Suppo...
SUPREMACY, the superiority or sovereignty of the king.

Sponge with warm water. (£.) Some vinegar, wine, or Hungary water is performed on the veins that lie on the internal part of the arm is generally called an abscess. See Medicine and Surgery.

SUPPURATION, the second way wherein an inflammation terminates, being a conversion of the inflamed blood and the soft adjacent parts, as the vessels and fat, into pus, or matter: which disorder, when it has not yet found an opening, is generally called an abscess. See Medicine and Surgery.

SUPPULATIVES, or suppurating medicines, such as promot suppuratum. See the preceding article.


SUPRALAPSARY, in theology, a person who holds that God, without any regard to the good or evil works of man, has resolved, by an eternal degree, to save some and damn others. There are also called antelapsaries, and are opposed to sublapsaries and infralapsaries.

SURASPINATUS, in anatomy. See Anatomy, p. 196.

SUPPRESSION in law, the extirpation or annihilating of surcoat, a coat of arms to be worn over the body, and by much the most frequent in use at this present time. See Heraldry.

SURCOAT, a coat of arms to be worn over the body, and is also used for the sealing of letters, and other documents, where the application of the hand, and is also used for the sealing of letters, and other documents, where the application of the hand, and other disorders, where the application of the hand, afflit by proper instruments, is necessary.

OF PHLEBOTOMY.

We begin with the operation of phlebotomy: because it is of all the most general, performed in most parts of the body, and by much the most frequent in use at this present day. By phlebotomy, or bleeding, we here intend the opening a vein, by a sharp-edged and pointed instrument of steel, for extracting a proper quantity of blood, either for the preservation or recovery of a person's health.

It is commonly enough known, that the operation of bleeding in the arm is performed on the veins that lie on the internal part of the cubit. There are several things worthy the surgeon's notice in this operation; some of which regard the things which are to be done preparatory to bleeding, some in the operation itself, others immediately after the performance of it. Preparatory to bleeding you should have in readiness: (1.) A linen fillet, about an ell in length, and two fingers in breadth. (2.) Two small square billboard. (3.) Porringers or vessels to receive the blood. (4.) A sponge with warm water. (5.) Some vinegar, wine, or Hungarian water, to raise the patient's spirits if he should be inclined to faint. (6.) Two assistants, one to hold the porringer, the other to reach you anything that you shall want. (7.) You must place your patient upon a couch: or, if he is fearful of the operation, lay him upon a bed, left he should fall into a swoon. Lastly, the operator should be as expert in bleeding with his left hand as with his right: For,

SUPPRESSION in medicine, is generally used for a retention of urine or the menopause. See Medicine, p. 160, 162.

SURCULUS, in the anatomy of plants, a word used to express that part of the branching of the ribs of a leaf, which is of a middle kind between the great middle rib and the smallest reticular ramifications.

SURD. See Algebra, p. 95.

SURETY, in law, generally signifies the sum with bail. See Bail.

SURFACE See Superficies.

SURSEIT, in medicine, a sickness proceeding from the fermentation of a load at the stomach, usually attended with eruptions, and sometimes with a fever. See Medicine.

SURGE, in the sea-language, the same with wave. See Wave.

Also when heaving at the capstan, if the cable royal or messenger slips a little, they call it surging.

SURGERY, the art of curing all manner of wounds, and other disorders, where the application of the hand, afflicted by proper instruments, is necessary.

As you are ready at bleeding in the right arm with your right hand, so when you are to open the veins of the left arm, you will find it necessary to use your left hand.

Though the operation is to be performed at once, with one puncture; yet many things are to be observed in order to render it successful. First, it is necessary for the surgeon to inspect his patient's arm diligently, that he may see the course of the veins: he must then take hold of the arm, and extend it towards his breast, tucking up the sleeve about a hand's breadth above the bend of the cubit, where he must make his ligation, rolling the fillet twice round, and fastening it with a knot. The veins being compressed, and the blood being stopped in its return, they will enlarge, and lie fairer to the eye. When you have bound up the arm in this manner, you let it go for a small time till the veins grow turgid. You are then to lay hold of the arm again in the same manner as we directed before, and extend it to your breast, having an assistant ready with the vessel in his hand, at a convenient distance for receiving the blood.

You are now to examine which vein lies fairest, and is therefore most proper to be opened. For you must observe, that in the arm there usually appear three principal veins. The first is called Vena Cephalica and is found in the external part of the arm. The second is termed Basilica, and lies on the internal part of the arm: In the right arm it is also called Hepatica; in the left Splenicus. The third, which is obliquely situated between the former two, is called Mediana. The median and basilic veins, as they are larger than the cephalic, discharge a greater quantity of blood, but are attended with more danger in the operation:

Tappe, ten miles east of the Indian sea; in E. long. 72° 20', N. lat. 21° 30'.

SURCHARGE, the name with overcharge, and whatever is above that which is just and right.

SURCOAT, a coat of arms to be worn over the body armour.

The surcoat is properly a loose thin taffety coat, with arms embroidered or painted on it, such as is worn by heralds: anciently also used by military men over their armour, to distinguish themselves by.

SURCULUS, in the anatomy of plants, a word used to express that part of the branching of the ribs of a leaf, which is of a middle kind between the great middle rib and the smallest reticular ramifications.
For a considerable artery and the brachial nerve lie under the bicipital vein, and the tendon of the biceps muscle under the median. But as they lie farther to the eye, and therefore more frequently the subjects of the operations we are treating of than the cephalic vein, it is safer and more eligible for the less experienced surgeons to open the bicipital, or at least the median vein.

When you have determined which vein to open, you are to perform the operation on that part which presents itself fairest to you. But if the vein has frequently been opened, and the part which appears largest and fairest is full of cicatrices, you are not to open above, but below the cicatrices, by which means the blood will discharge itself more freely: For the part above is generally threatened by the cicatrices.

Before you apply the lancet to the skin, when the veins are not rifened, it will be proper to rub the arm below the bandage, which will drive the blood back towards the cubit, and render the veins more turgid. Whilst this is doing in the right arm, the surgeon should take hold of the patient's arm in such a manner that he may lay his thumb upon the vein he intends to open, to prevent the blood from flowing back, and to keep the vein from rolling. You are now to fix your eye upon that part of the vein which you intend to open, and taking the lancet with your right hand, so placed that the thumb and first finger may be fixed about the middle of the blade; the other fingers should rest gently upon the patient's arm, to prevent your hand from flipping.

Your lancet is now to be pushed lightly and carefully forward by your thumb and fore-finger, till it has penetrated through the coats of the vein; and at that instant to be raised a little upwards, in order to enlarge the orifice of the wound, which will give a freer passage to the blood. The most common and convenient size of an orifice is about twice the breadth of the back of an ordinary knife. You are to keep even between the two extremes of rashness and timidity in making the puncture. For as in one case you will only divide the common integuments, and so leave your work undone; in the other you will run the risk of wounding the artery, nerve, or tendon.

Your aperture being thus made, and the instrument drawn instantly back, the blood will then rush forth from the orifice either in a large or small stream. In the mean time the blood must be permitted to flow as long as it shall be judged useful or necessary; and if it should stop too soon, as it often may from too great a stricture of the bandage on the arm, it must be slackened a little, by which means the compressed artery being set at liberty, the blood will flow from the orifice as at first. If you find the orifice obstructed by too great a tension of the skin, or an intrusion of the membrana adiposa, you ought in that case to return the bit of fat, by pressing with the finger or a warm sponge, and to relax the skin by bending the arm a little. Lastly, if the orifice be obstructed by thick, gumous, or congealed blood, that impediment may be removed by wiping it with a sponge dipped in warm water.

But that the patient's arm may not become painful or languid, by holding it long extended, the surgeon should support it by the cubitus for a little while; and then give him a flick, or other cylindric body, to turn round in his hand, that by the contractions of the flexor and extensor muscles of the fingers, the course of the blood may be accelerated towards the cubitus: which will still be further promoted, if the patient urges a little voluntary cough.

When there seems to be a sufficient quantity of blood discharged, the ligature must then be immediately taken off from above the elbow, and the skin about the orifice must next be gently stroked or pressed together by the two fore-fingers of the left hand; by which means the lips of the divided vein are more easily compressed and closed. But while the surgeon is doing this with his left hand, he takes the smallest of the two compresses, and applies it upon the incision with his right hand: but so as to let what little blood may remain between the orifice and the vein, be discharged, before he imposes the compresses. Over the first or small compress he should impose another that is a little larger, pressing them both gently on the orifice with his left thumb, till the bandage is laid across.

Having applied your bandage, and drawn down the patient's sleeve over his arm; he should be ordered not to use it too early or violently, before the orifice is well closed, which might excite a fresh hemorrhage, an inflammation, suppuration, or other bad accident. And if the patient should faint away soon after the operation, it may be then convenient to wet his navel with Hungary water or vinegar; and to sprinkle some of the laft, or else cold water, in his face; and, especially in summer-time, to let in the fresh and cool air, by opening the windows, &c. Also, if any wine or cordial water be at hand, you may give the languishing patient a small draught thereof.

Of Bleeding in the Foot.

Bleeding in the foot is an operation of very old standing: it having been an observation made by the most ancient physicians, that phlebotomy in this part proved highly serviceable in most disorders of the head and breast, and for an obftruction of the menftrial and hemorrhoidal flux; upon which discharges greatly depended the healthy state of both sexes. For these reasons they therefore denominated those veins of the foot, Saphena and Cephalica: the laft of which extends itself from the internal ankle to the great toe; and the first, from the external malleolus to the smaller toes. But why one of them should be thought or denominated more cephalic than the other, there is not the least reason to be offered: since bleeding from either of them has altogether the same effect. Therefore, the surgeon should always open that which lies fairest and most conspicuous. But if the veins upon the metatarsus, or above of the foot, do not well appear, it may then be convenient to open one of those at the ankle, or about the calf or ham of the leg. Nor is the phlebotomist so liable to injure any of the tendons in the foot as he is upon the metatarsus.

For the more easy and successful apertion of these veins, the patient must first wash both feet well for some time in hot water; that when the veins become sufficienlly turgid, the surgeon may take his choice of that which presents itself either in the right or left foot, without paying any deference to the direction of right or left in any of the forementioned disorders. Having fixed upon the particular foot and vein, your ligature must be applied about two fingers breadth above the ankle; and then the patient must return it into the warm water, while the surgeon takes out and prepares his instrument or lancet. Then kneeling down on one knee, the surgeon takes out the patient's foot from the warm water, and having wiped it dry with a napkin, places it upon his other knee, or else upon a board laid over the vefel of hot water; and having wiped it dry with a napkin, places it upon his other knee, or else upon a board laid over the vefel of hot water; and, after having sufficiently dried it with a towel, he proceeds to the operation.
Of Bleeding in the Veins of the Forehead, Temples, and Occiput.

There are many physicians and surgeons, who think that bleeding by the veins of the forehead and temples is much more serviceable and expeditious in relieving all disorders of the head, such as violent pains, vertigo, delirium, melancholy, and raving madness, than the like discharge by veins more remote from the parts affected; judging that their vicinity renders them more capable of evacuating the offending matter of the disease. Before proceeding to cut the veins, an handkerchief or neckcloth ought to be drawn tight round the neck; that, by compressing the jugular vein, those branches of it may become more turgid and conspicuous. The vein being opened, the patient must hold down his head, that the blood may not trickle from his forehead into his eyes or mouth, when the stream does not spout out with sufficient force. If the blood does not stop after a due quantity is discharged, you must compress the orifice with your finger, and after wiping the forehead and face, apply a compress or two, and then your bandage. Bleeding from the occipital veins, which communicate with the lateral sinuses of the dura mater, is both by reason and experience proved to be serviceable in most disorders of the brain, where that part is overcharged with blood, which may be this way diverted and evacuated. The celebrated anatomist Morgagni especially recommends it, with scarification and cupping in those parts, for all lethargic and face, apply a compress or two, and then your bandage. The orifice with your finger; and, after wiping the forehead and temple, remove the ligature from the neck; upon which the blood stops without any danger of a fresh hemorrhage. Lastly, it must be acknowledged, that the patient faints away as readily after bleeding in the neck, as the jugular veins are safely and easily opened: but no danger follows from thence.

Of Bleeding in the Veins, called Ranula, under the Tongue.

It is very often found of no small service in a quinsy, or other inflammatory disorder of the neck, to bleed in the two small veins which run under the tip or end of the tongue; especially if a larger vein has been opened before, either in the neck, foot, or arm, whereby the inflamed and stagnated blood may be gradually evacuated. To bleed in these veins, a nick being made upon the neck as before, you then elevate the apex of the tongue with your left hand, while, with the lancet in your right, you circumspectly open first one, and then the other on each side; because the portion of one only will hardly ever discharge blood enough to give any considerable relief. When you judge a sufficient quantity of blood has run out of the mouth into your vessel, remove the ligature from the neck: upon which the flux usually stops of itself. But if it should still continue, let the patient take a little vinegar or Frontinio wine in his mouth: or else you may apply a bit of vitriol or alcohol, or a compress dip't in some astringent liquor, till the hemorrhage ceases; which can never be dangerous even without such topics.

Of Phlebotomy in the Penis.

Bleeding in the vena dorsalis penis usually surpasses the benefit of all remedies whatever in abating inflammatory disorders of this member. This large vein, which runs along the back or upper side of the penis, being generally pretty much dilated, and conspicuous in an inflammation of this part, may be incised either under the middle or back part of the penis; and kept bleeding till the member becomes flaccid, and a sufficient quantity of blood be discharged proportionable to the urgency of the symptoms. This done, you must apply a compress, and the bandage proper for the penis. But you must carefully endeavour to avoid injuring the arteries or nerves which enter the penis near this vein; for if not, your handage too strict; for by these means the inflammation and symptoms may turn out worse than before.
the progress of healing a large wound, when it is made with a sharp instrument, and the constitution is pure.

In this circumstance, the blood-vessels, immediately upon their division, bleed freely, and continue bleeding till they are either stopped by art, or at length contracting and withdrawing themselves into the wound, their extremities are shut up by the coagulated blood. The hemorrhage being stopped, the next occurrence, in about twenty-four hours, is a thin serous discharge; and, a day or two after, an increase of it, though somewhat thickened, and thickening in this state it continues two or three days without any great alteration, from which time the matter grows thicker and more offensive; and when the bottom of the wound fills up with little granulations of flesh, it diminishes in its quantity, and continues doing so till the wound is quite skinned over.

The first stage of healing, or the discharge of matter, is by ulcers called digestion; the second, or the filling up with flesh, incarination; and the last, or skimming over, cicatrization.

It is worth observing, that the loss of any particular part of the body can only be repaired by the fluids of that distinct part; and as in a broken bone, the callus is generated from the ends of the fracture, so, in a wound, is the cicatrix from the circumference of the skin only: Hence arises the necessity of keeping the surface even, either by pressure or eating medicines, that the eminence of the flesh may not refill the spaces of the skin in their tendency to cover the wound. This eminence is composed of little points or granulations called fungus, or proud flesh, and is frequently esteemed an evil, though in truth this species of it be the constant attendant on healing wounds; for when they are smooth, and have no disposition to flux out above their lips, there is a thicknes of flesh, and a cure is very difficultly effected. Since then a fungus prevents healing only by its luxuriance, and all wounds cicatrize from their circumference, there will be no occasion to destroy the whole fungus every time it rises, but only the edges of it near the lips of the skin; which may be done by gentle escharotics, such as lint dipr in a mild solution of vitriol, or for the most part only by dry lint, and a tight bandage, which will reduce it sufficiently to a level, if applied before the fungus have acquired too much growth. In large wounds, the application of corrosive medicines to the whole surface, is of no use; because the fungus will attain but to a certain height; when left to itself, which it will be frequently rising up to, though it be often walled; and as all the advantage to be gathered from it, is only from the evenness of its margin, the purpose will be as fully answered by keeping that under only, and an infinite deal of pain avoided from the continual repetition of escharotics.

From what has been said of the progress of a wound made by a sharp instrument, where there is no indisposition of body, we see the cure is performed without any interruption, but from the fungus; so that the business of surgery will consist principally in a proper regard to that point, and in applications that will the least interfere with the ordinary course of nature, which in these cases will be as much as act the least upon the surface of the wound; and agreeably to this we find, that dry lint only is generally the best remedy through the whole course of dressing; at first, it flops the blood with less injury than any flypick powders or waters; and afterwards, by absorbing the matter, which in the beginning of suppuration is thin and acrimonious, it becomes in effect a digestive: during incarnation it is the softest medium that can be applied between the roller and tender granulations, and at the same time is an easy compress upon the sprouting fungus.

Over the dry lint, may be applied a pledget of some soft ointment spread upon tow, which must be renewed every day, and preferred in its situation by a gentle bandage; though in all large wounds, the first dressing, after that of the accident or operation, should not be applied in less than three days, when the matter being formed, the lint separates more easily from the part; in the removal of which, no force should be used, but only so much be taken away as is loole and comes off without pain.

Of Inflammations and Abscesses.

As almost all abscesses are the consequences of inflammations, and these produce a variety of events, as they are differently complicated with other disorders, it will be proper first to make some inquiry into their disposition. Inflammations from all causes have three ways of terminating; either by dispersion, suppuration, or gangrene.

But though every kind of inflammation will sometimes terminate in different shapes, yet a probable conjecture of the event may be always gathered from the state of the patient’s health. Thus inflammations happening in a slight degree upon colds, and, without any foregoing indisposition, will most probably be dispersed: those which follow close upon a fever, or happen to a very hot habit of body, will generally impoverish: and those which fall upon very old people, or drophical constitutions, will have a strong tendency to gangrene.

If the state of an inflammation be such, as to make the dispersion of it safely practicable, that end will be best brought about by evacuations, such as plentiful bleeding and repeated purges: the part itself must be treated with emollients twice a day; and if the skin be very tense, it may be embozicated with a mixture of three fourths of oil of roses, and one fourth of common vinegar, and afterwards covered with ungunt Americana: or a soft ointment made of hogs wax and sweet oil, spread upon a fine rag, and rolled on gently. If after four or five days, the inflammation begin to subside, the purging-waters and manna may take place of other purges, and the embrocation of oil and vinegar be now omitted, or sooner, if it has begun to excoriate. The ointment of wax and oil may be continued to the last. During the cure a thin diet is absolutely necessary, and in the height of the inflammation the drinking of thin liquors is of great service.

Here we have supposed that the inflammation had so great a tendency to diffusion, as, by the help of proper affiduity, to terminate in that manner; but when it happens that the disposition of the tumour refists all ductinent means, we must then desist from any further evacuations, and assist nature in the bringing on a suppuration.

That matter will most likely be formed, we may judge from the increase of the symptomatic fever, and enlargement of the tumour, with more pain and pulsation; and if a small rigor come on, it is hardly to be doubted. Inflammations after a fever, and the small-pox, almost always suppurate; but these presently discover their tendency, or at least should be at first gently treated, as though we expected an impothisation. It is a maxim laid down in surgery,
surgery, that evacuations are pernicious in every circumstance of a disease, which is at last to end in suppuration: But as physicians do now acknowledge, that bleeding on certain occasions in the small-pox, is not only no impediment to the maturation, but even promotes it; so in the formation of abscesses, when the vesicles have been clotted, and the suppuration has not kindly advanced, bleeding has sometimes quickened it accordingly; but, however, this practice is to be followed with caution. Purges are, no doubt, improper at this time; yet if the patient be collyve, he must be afflicted with gentle enemias every two or three days.

Of all the applications invented to promote suppuration, there are none so easy as poultices; but as there are particular tumours very slow of suppuration, and almost void of pain (fuch, for instance, are some of the scrophulous swellings) it will be left troublesome in these cases to wear the gum-plasters, which may be renewed every four or five days only. Amongst the suppurative poultices, perhaps there is none preferable to that made of bread and milk softened with oil; at least the advantage of any other over it is not to be distinguished in practice. The abscesses may be covered with the poultice twice a day, till it come to that ripeness as to require opening, which will be known by the thinness and eminence of the skin in some part of it, a fluctuation of the matter, and generally speaking, an abatement of the pain previous to these appearances.

The figs of a gangrene are these: the inflammation loses its redness, and becomes dusky and livid; the tenesmus of the skin goes off, and feels to the touch flabby or emphysemous; vesicles filled with ichor of different colours spread all over it; the tumour subsides, and, from a dulcet complexion, turns black, the pufie quickens and sinks, and profuse sweats coming on, at last grow cold, and the patient dies.

To stop the progress of a mortification, the method of treatment will be nearly the same, from whatever cause it proceed, except in that arising from cold; in which case, we ought to be cautious not to apply warmth too suddenly to the part, if it be true, that in the northern countries they have daily conviction of gangrenes produced by this means, which might have been easily prevented by avoiding heat; nor, they carry their apprehension of the danger of sudden warmth so far as to cover the part with snow first, which does not appear often necessary to apply causticks; yet they are of molt use in cases where the skin is thin and inflamed: and we have reason to think the malignity of the abscess is of that nature as to prevent a quickness of incising; in which circumstance, if an incision only were made through the skin, little flaws would often form, and burrow underneath, and the lips of it lying loose and flabby, would become callous, and retard the cure, though the malignity of the wound were corrected: of this kind are venereal buboes, which notwithstanding they often do well by mere incision, yet when the skin is in the state we have supposed, the cautick is always preferable: but this method should be confined to venereal buboes; for those which follow a fever, or the small-pox, or the most part are curable by incision only. There are many scrophulous tumours, where the reasoning is the same as in the venereal: and even in great swellings, if the patient will not submit to cutting, and the surgeon is apprehensive of any danger in wounding a large vessel, which is often done with the knife, yet as this inconvenience is avoided by cautick, it may on such an occasion be made use of; however, in scrophulous swellings of the neck and face, unless they are very large, causticks are not advisable, since in that part of the body, with length of time, they heal after incision. Cauticks are of great service in destroying stubborn scrophulous indurations of the glands, also venereal indurations of the glands of the groin, which will neither diffuse nor suppurate; likewise in exposing carious bones, and making

In small abscesses, there is seldom a necessity for greater dilatation than a little orifice made with the point of a lancet; and in large ones, where there is not a great quantity of skin discoloured and become thin, an incision to their utmost extent will usually answer the purpose; or if there be much thin discoloured skin, a circular or oval piece of it must be cut away; which operation, if done dexterously with a knife, is much less painful than by cautick, and at once lays open a great space of the abscess, which may be dressed down to the bottom, and the matter of it be freely discharged; whereas, after a cautick, though we make incisions through the eflchar, yet the matter will be under some confinement; and we cannot have the advantage of dressing properly till the separation of the flough, which often requires a considerable time, so that the cure must be necessarily delayed; besides that the pain of burning continuing two or three hours, which a cautick usually requires in doing its office, draws such a friction upon the skin round the eflchar, as sometimes to indispose it very much for healing afterwards. In the use of cauticks, it is but too much a practice, to lay a small one on the most prominent part of a large tumour, which not giving sufficient vent to the matter, and perhaps the orifice too soon after growing narrow, leads on to the necessity of employing tents; which two circumstances more frequently make fistulas after an abscess, than any malignity in the nature of the abscess itself. The event would more certainly be the same after a small incision; but surgeons not depending so much on small openings by incision, as by cautick, do, when they use the knife, generally dilate sufficiently; whereas, in the other way, a little opening in the most depending part of the tumour usually satisfies them.

From this account of the method of opening abscesses, it does not appear often necessary to apply cauticks; yet they have their advantages in some respects, and are seldom so terrible to patients as the knife, though in fact they are frequently more painful to bear. They are of most use in cases where the skin is thin and inflamed: and we have reason to think the malignity of the abscess is of that nature as to prevent a quickness of incising; in which circumstance, if an incision only were made through the skin, little flaws would often form, and burrow underneath, and the lips of it lying loose and flabby, would become callous, and retard the cure, though the malignity of the wound were corrected: of this kind are venereal buboes, which notwithstanding they often do well by mere incision, yet when the skin is in the state we have supposed, the cautick is always preferable: but this method should be confined to venereal buboes; for those which follow a fever, or the small-pox, or the most part are curable by incision only. There are many scrophulous tumours, where the reasoning is the same as in the venereal: and even in great swellings, if the patient will not submit to cutting, and the surgeon is apprehensive of any danger in wounding a large vessel, which is often done with the knife, yet as this inconvenience is avoided by cautick, it may on such an occasion be made use of; however, in scrophulous swellings of the neck and face, unless they are very large, cauticks are not advisable, since in that part of the body, with length of time, they heal after incision. Cauticks are of great service in destroying stubborn scrophulous indurations of the glands, also venereal indurations of the glands of the groin, which will neither diffuse nor suppurate; likewise in exposing carious bones, and making
making large issues. The best cautick in use is a pall made with lime and lixivium capitale, which is to be prevented from spreading, by cutting an orifice in a piece of sticking plaster, nearly as big as you mean to make the eschar; which being applied to the part, the cautick must be laid on the orifice, and preferred in its situation by a few slips of plaster laid round its edges, and a large piece over the whole. When issues are made, or bones exposed, the eschar should be cut out immediately, or the next day: for if we wait the separation, we miscarry in our design of making a deep opening; since sloughs are flung off by the sprouting new flesh underneath, which fills up the cavity at the same time that it discharges the eschar; so that we are obliged afterwards to make the opening a second time with painful escharotic medicines. To make an issue, or lay a bone bare, this cautick may lie on about four hours; to destroy a large gland, five or six; and to open abscesses, an hour and a half, two hours, or three hours, according to the thickness of the skin; and what is very remarkable, notwithstanding its strength and sudden efficacy, it frequently gives no pain where the skin is not inflamed, as in making issues, and opening some few abscesses.

When an abscess is already burst, we are to be guided by the probe where to dilate, observing the same rules with regard to the degree of dilatation as in the other cases. The usual method of dilating, is with the probe, compafs, and indeed, in all abscesses, the generality of surgeons use the compafs, after having first made a puncture with a lancet: but as the knife operates much more quickly, and with less violence to the parts than compafs, which squeeze at the same time that they wound, it will be sparing the patient a great deal of pain to use the knife, where ever it is practicable, which is in almost all cases, except some fistula’s in ano, where the compafs are more convenient. The manner of opening with a knife, is by sliding it on a director, the groove of which prevents its being misguided. If the orifice of the abscess be so small as not to admit the director, or the blade of the compafs, it must be enlarged by a piece of sponge-tent; which is made by dipping a dry bit of sponge in melted wax, and immediately squeezing as much out of it again as possible, between two pieces of tile or marble; the effect of which is, that the loofe sponge being compessed into a small compafs, if any of it be introduced into an abscess, the heat of the part melts down the remaining wax that holds it together, and the sponge sucking up the moisture of the abscess, expands, and in expanding opens the orifice wider, and by degrees, so as to give very little pain.

The usual method of dressing an abscess, the first time, is with dry lint only; or if there be no flux of blood, with soft digestive spread on lint. If there be no danger of the upper part of the wound reuniting too soon, the dofts must be laid in loose; but if the abscess be deep, and the wound narrow, as is the case sometimes of abscesses in ano, the lint must be crammed in pretty tightly, that we may have afterwards the advantage of dressing down to the bottom without the use of tents, which, by refining the growth of the little granulations of flesh, in process of time harden them, and in that manner produce a fistula; so that, instead of being used for the cure of an abscess, they never should be employed but where we mean to retard the healing of the external wound, except in some little narrow abscesses, where, if they be not crammed in too large, they become as dofts, admitting of incarnation at the bottom; but care should be taken, not to infinate them much deeper than the skin in this case, and that they should be repeated twice a day, to give vent to the matter they confine. But tents do most good in little deep abscesses, whence any extraneous body is to be evacuated, such as small splinters of bone, &c.

The use of vulnerary injections into abscesses has been thought to bear so near a resemblance to the use of tents, that they both fell into disuse almost at the same time.

Over the dofts of lint may be laid a large pledget of tow spread with balsam, which will lie softer than a definative platter; for this, though designed to defend the circulation of wounds against inflammation or a fluxion of humours, is often the very cause of them; so that the dressings of large wounds should never be kept on by these plasters, where there is danger of such accidents. In this manner, the dressings may be continued, till the cavity is incarned; and then it may be cicatrized with dry lint, or some of the cicatrizing ointments, observing to keep the fungous down, as directed before.

In the course of dressing it will be proper to have regard to the situation of the abscess, and as much as possible to make the patient favour the discharge by his ordinary posture: and to this end also, as what is of greater importance than the virtue of any ointment, the discharge must be assisted by compafs and bandage; the compafs may be made of rags or platter; though the latter is sometimes preferable, as it remains immovable on the part it is applied to. The frequency of dressing will depend on the quantity of discharge: once in twenty-four hours is ordinarily sufficient; but sometimes twice, or perhaps three times, is necessary.

Of Ulcers.

When a wound or abscess degenerates into so bad a state as to render the methods of cure above laid down, and rules that completion which belongs to a healing wound, it is called an ulcer; and as the name is generally borrowed from the ill habit of the fore, it is a cullion to apply it to all sores that have any degree of malignity, though they be immediately formed without any previous abscess or wound; such are the venereal ulcers of the tonsils, &c.

Ulcers are distinguished by their particular disorders, though it seldom happens that the affections are not complicated; and when we lay down rules for the management of one species of ulcer, it is generally requisite to apply them to almost all others. However, the characters of most eminence are, the callous ulcer, the fistulous ulcer, and the ulcer with caries of the adjacent bone: the abundance of more known to surgeons, such as the putrid, the corrosive, the varicosus, &c. but as they have acquired their names from some particular affection, we shall speak of the treatment of them under the general head of ulcers.

It will be often in vain to pursue the best means of cure by topical application, unless we are assisted by internal remedies; for as many ulcers are the effects of a particular indisposition of body, it will be difficult to bring them into order, while the caufe of them remains with any violence; though they are sometimes in a great degree the discharge of the indisposition itself, as in the plague, small-pox, &c. But we see it generally necessary in the pox, the scurvy, obstructions of the menes, dropsies, and many other diseases, to give internals of great efficacy; and indeed, there are hardly any constitutions where ulcers are not assisted by some physical regimen. Those that are cancerous and
and scrophulous seem to gain the least advantage from phy-

cic; for if in their beginnings they have sometimes been very

much relieved, or cured, by salivation, or any other evacu-

tion, they are also often irritated and made worse by them;

so that there is nothing very certain in the effects of violent

medicines in these distempers. Upon the whole, in both

these cafes, the milk-diet, and gentle purgings with manna,

and the waters, seem to be most efficacious; though brisk

methods may be used with more safety in the evil than in the

cancer; and sometimes, particularly in young subjects, the

decocation of the woods is extremely beneficial for scrophu-

lous ulcers: but it has lately been attested by men of great

skill and veracity, that sea-water is more powerful than any

other remedy hitherto known, both for scrophulous ulcers,

and scrophulous tumours.

When an ulcer becomes foul, and discharges a nasty thin

ichor, the edges of it, in process of time, tuck in, and growing

skinned and hard, give it the name of a callous ulcer,

which, so long as the edges continue in that state, must

necessarily be prevented from healing: But we are not imme-

diately to destroy the lips of it, in expectation of a sudden

cure; for while the malignity of the ulcer remains, which

was the occasion of the callosity, so long will the new lips

be subject to a relapse of the same kind; however often the

external surface of them be destroyed: so that when we have

to deal with this circumstance, we are to endeavour to bring

the body of the ulcer into a disposition to recover by other

methods. It sometimes happens to poor laborious people,

who have not been able to afford themselves reft, that lying

a-bed will in a short time give a diversion to the humours of

the part, and the callous edges softening, will without any

great assistance shoot out a cicatrix, when the ulcer is grown

clean and filled with good flesh: the effect of a salivation is

generally the same; and even an issue does sometimes dif-
poe a neighbouring ulcer to heal: but though callosities be

frequently softened by these means, yet when the surface

of the ulcer begins to yield thick matter, and little granula-
tions of red flesh shoot up, it will be proper to quicken nature

of the ulcer begins to yield thick matter, and little granula-
tions of red flesh shoot up, it will be proper to quicken nature

and every attempt with escharoticks will be only a

repetition of pain to the patient without any advantage.

When the excrecence is cancerous, and does not rise

from a large cancer, but only from the skin itself, it has

been usual to recommend the actual cautery, but it is better
to cut away quite underneath, and dress afterwards with easy

applications. As to the treatment of incurable cancers

erations, after much trial, surgeons have at last discovered,

what gives the most ease to the fore is the most suitable

application; and therefore the use of escharoticks is not to

be admitted on any pretence whatsoever; nor in those parts

of a cancer that are corroded into cavities, must the precipi-
tate be made use of to procure digestion, or promote the

separation of the sloughs. The best way, therefore, is to

be guided by the patient what medicine to continue. Those

usually prefcribed are preparations from lead; but what we

have found most beneficial, have been sometimes dry lint

alone when it does not stick to the cancer; at other times,

lint dolfis spread with Bassifion or Cera. de Lapid. Calam.

and oftener than either with a Cerate made of oil and wax,

or the Sperm. Cet. ointment; and over all, a pledgit of tow

spread with the fame. Embrocating the neighbouring skin

and edges of it with milk, is of service; but the chief good

is to be acquired by diet, which should be altogether of milk

and things made of milk, though herbage may be admitted

also. Issues in the shoulders or thighs do also alleviate the

symptoms; and manna, with the purging waters, once, or

perhaps twice a-week, will serve to keep the body cool.

When ulcers or abscesses are accompanied with inflamma-

tion and pain, they are to be affilled with fomentations made

of some of the dry herbs, such as Roman wormwood, bay-

leaves, and rosemary; and when they are very putrid and

corrosive, which circumstances give them the name of foul

phagedenic ulcers, some spirits of wine should be added to

the fomentation, and the bandage be also dipt in brandy

and fomented.
S U R G E R Y.

or spirits of wine, observing in these cases where there is much pain, always to apply gentle medicines till it be removed.

When the pain and inflammation are excessive, bleeding and other evacuations will often be serviceable; and above all things, rest and a horizontal position: which last circumstance is of great importance to the cure of ulcers of the legs, that unless the patient will conform to it strictly, the skill of the surgeon will often avail nothing; for as the indig-nity of these foses is in some measure owing to the gravitation of the humours downwards, it will be much more beneficial to be laid along than sit upright, though the leg be laid on a chair; since even in this posture they will descend with more force, than if the body was reclined.

In ulcers of the legs, accompanied with varices or dilata-
tions of the veins, the method of treatment will depend upon the other circumstances of the fore; for the varix can only be affailed by the application of bandage, which must be continued a considerable time after the cure. The neatest bandage is the Irait leeching, which is particularly serviceable in this case; though, however, if the legs be oeodematus, or, if after the healing of the ulcers, they swell when the patient quits his bed, it may be worn with safety and advantage. There are instances of one vein only being various, which when it happens, may be destroyed by tying it above and below the dilatation, as in an aneurism; but this operation should only be practised where the varix is large and painful.

Ulcers of many years standing are very difficult of cure; and in old people the cure is often dangerous, frequently exciting an asthmatic, a diar-rhoea, or a fever, which destroys the patient, unless the fore break out again; so that it is altogether advisable to attempt the absolute cure in such cases, but only the reduction of them into better order, and less compains, which, if they be not malignant, is generally done with rest and proper care. The cure of those in young people may be undertaken with more safety; but we often find it necessary to raise a salivation to effect it, though, when completed it, does not always last; so that the prospect of cure in stubborn old ulcers, at any time of life, is but indifferent. In all these cases, however, it is proper to purge once or twice a-week with calomel, if the patient can bear it, and to make an issue when the fore is almost healed, in order to continue a dischage the constitution has been so long habituated to, and prevent its falling from the cicatrix, and bursting out again in that place.

When an ulcer or abscess has any sinus or channels opening and discharging themselves into the fore, they are called sinus ulcers. These sinus, if they continue to drain a great while, grow hard in the surface of their cavity, and then are termed fistula, and the ulcer a fistulous ulcer; also, if matter be discharged from any cavity, as those of the joints, abdomen, &c. the opening is called a sinus ulcer, or a fistula.

The treatment of these ulcers depends upon a variety of circumstances. If the matter of the sinus be thick, strict bandage and compres will sometimes bring the opposite sides of the sinus to a reunion: if the sinus grow turgid in any part, and the skin thinner, flowing a disposition to break, the matter must be made to pull more against that part, by plugging it up with a tent; and then a counter opening must be made, which proves often sufficient for the whole abscess, if it be not afterwards too much tented, which locks up the matter and prevents the healing; or too little, which will have the same effect; for dressing quite superficially, does sometimes prove, inAmbulances as tents, and for nearly the same reason, since suffering the external wound to contract into a narrow orifice before the internal one be incased, does almost as effectually lock up the matter as a tent: to preserve then a medium in these cases, a hollow tent of lead or silver may be kept in the orifice, which, at the same time that it keeps open, gives vent to the matter. The abscesses where the counter opening are made most frequently, are those of compound fractures, and the break; but the latter do often well without dilatation than the former, though it must be performed in both, if practicable, the whole length of the abscess, when after some trial the matter does not lessen in quantity, and the sides of it grow thinner; and if the sinuses be fistulous, there is no expectation of cure without dilatation. There are also a great many fistulous abscesses of the neck, that sometimes communicate by sinuses running under large indurations; in which instances, counter openings are advisable, and generally answer without the necessity of dilating the whole length; and indeed there are few abscesses in this distemper, which should be opened beyond the thickness of the skin. When abscesses of the joints discharge themselves, there is no other method of treating the fistula, but by keeping it open with the cauters already laid down, till the cartilages of the extremities of the bones being corrodcd, the two bones shoot into one another, and form an ankylosis of the joint, which is the most usual cure of ulcers in that part.

Gun-shot wounds often become fistulous ulcers, and then are to be considered in the same light as those already described; though surgeons have been always inclined to conceive there is something more mysterious in these wounds than any others: but their terribleness is owing to the violent contusion and laceration of the parts, and often to the admission of extraneous bodies into them, as the bullet, splinters, clothes, &c. and were any other force to do the same thing, the effect would be exactly the same as when done by fire-arms. The treatment of these wounds consists in removing the extraneous body as soon as possible; to which end the patient must be put into the same posture as when he received the wound: if it cannot be extracted by cutting upon it, which should always be practised when the situation of the blood-vessels, &c. does not forbid, it must be left to nature to work out, and the wound dressed superficially; for we must not expect, that if it be kept open with tents, the bullet, &c. will return that way; and there is hardly any case where tents are more pernicious than here, because of the violent tension and disposition to gangrene which presently ensue. To guard against mortification in this, and all other violently contused wounds, it will be proper to bleed the patient immediately, and soon after give a cynder; the part should be dressed with felt digesives, and the compres and roller applied very loofe, being first dip in brandy or spirits of wine. The next time the wound is opened, if it be dangerous, the spirituous fomentation may be employed, and after that continued till the danger is over. If a mortification comes on, the applications for that disorder must be used. In gun-shot wounds, it seldom happens that there is any effusion of blood, unless a large vessel be torn; but the bullet gives an echar, which usually separates in a few days, and is followed with a plentiful discharge; but when the wound...
come to this period, it is manageable by the rules already laid down.

When an ulcer with loose rotten flesh discharges more than the size of it should yield, and the discharge is oily and flaming, in all probability the bone is carious; which may easily be distinguished by running the probe through the flesh; and if so, it is called a carious ulcer. The cure of these ulcers depends principally upon the removal of the rotten part of the bone, without which it will be impossible to heal, as we sometimes even in little foci of the lower jaw, which taking their rise from a rotten tooth, will admit of exfoliation; but those produced by the evil, where the whole extremities of spongy parts of the bone are affected, are exceedingly dangerous, though all enlarged bones be not necessarily carious; and there are ulcers sometimes on the skin that covers them, which do not communicate with the bone and consequently do well without exfoliation: may, it sometimes happens, though the case be rare, that, in young subjects particularly, the bones will be carious to such a degree, as to admit a probe almost thro' the whole substance of them, and yet afterwards admit of a cure, without any notible exfoliation.

The method of treating an ulcer with a caries, is by applying a cautleick of the size of the scale of the bone that is to be exfoliated, and after having laid it bare, to wait till such time as the carious part can, without violence be separated, and then heal the wound. In order to quicken the exfoliation, there have been several applications devised; but that which has been most used in all ages, is the actual cautery, with which sponges burn the naked bone every day, or every other day, to dry up, as they say, the mucus, and by that means procure the separation: but as this practice is never of great service, and always cruel and painful it is now pretty much exploded. Indeed, from considering the appearance of a wound; when a scale of bone is taken out of it, there is hardly any question to be made, but that burning retards rather than hastens the separation; for as every scale of a carious bone is flung off by new flesh generated between it and the found bone, whatever would prevent the growth of these granulations, would also in a degree prevent the exfoliation; which must certainly be the effect of a red hot iron applied so close to it; though the circumfances of carious bones, and their disposition to separate, are so different from one another, that it is hardly to be gathered from experience, whether they will sooner exfoliate with or without the assistance of fire; sometimes in both methods, an exfoliation is not procured in a twelve month, and at other times it happens in three weeks or a month; however, if it be only uncertain whether the actual cautery be beneficial or not, the cruelty that attends the use of it should entirely banish it out of practice. It is often likewise, in these cases, employed to keep down the fungous lips that spread upon the bone; but it is much more painful than the charioteer's medicines; though there will be no need of either, if a regular compresse be kept on the dressings; or at worst, if a flat piece of the proper forge, of the size of the ulcer, be rolled on with a tight bandage, it will swell on every side, and dilate the ulcer without any pain.

Some caries of the bones are so very shallow, that they crumble intensibly away, and the wound fills up; but when the bone will neither exfoliate nor admit of granulations, it will be proper to scrape it with a rugine, or perforate it in many points with a convenient instrument down to the quick. In the evil, the bones of the carpus and tarsus are often affected, but their sponginess is the reason that they are seldom cured: so that when these, or indeed the extremities of any of the bones, are carious through their substance, it is adviseable to amputate: though there are instances in the evil, but more especially in critical abscesses; when after long discharging down, the splinters, and sometimes the whole substance of the small bones, have worked away, and a healthy habit of body coming on, the ulcer has healed; but these are so rare, that no great dependence is to be laid on such an event. The dressings of carious bones, if they are flaming, may be dissolved in the tincture of myrrh; or if there be of dry lint are easiest, and keep down the edges of the ulcer better than any other gentle applications.

Burns are generally esteemed a distinct kind of ulcers, and have been treated with a greater variety of applications than any other species of fore.

When burns are very superficial, not raising suddenly any vellecity, spirits of wine are laid to be the quickest relief; but whether they be more serviceable than embrocations with linseed oil, is uncertain, though they are used very much by some persons whose trade subjects them often to this misfortune. If the burn excoriates, it is easiest to roll the part up gently with bandages dipped in sweet oil; or a mixture of vinegar for法人, with the oil: when the excoriations are very tender, dropping warm milk upon them every dressing is very comfortable; or if the patient can bear to have flannels wrung out of it, applied hot, it may be still better: if the burn have formed eichares, they may be dressed with balsamic, though generally oil alone is easier; and in these fores, whatever is the caudal medicine will be the best digestible. There is great care necessary to keep down the fungus of burns, and heal the wounds smooth; to which end, the edges should be dressed with lint dippt in aqua virriil and dried afterwards; or they may be touched with the vitriol done, and the dressings be repeated twice a day. There is also a greater danger of ulceration from burns after the cure, than from other wounds; to obviate which, embrocations of neat's-foot oil, and bandage with stale boards to keep the part extended, are absolutely necessary, where they can be applied.

Explanation of Plate CLVII. fig. 1.

A director by which to guide the knife in the opening of abscesses that are burth themselves, or first punctured with a lancet. This instrument should be made either of steel, silver, or iron; but so tempered, that it may be bent and accommodated to the direction of the cavity. It is usually made quite straight; but that form prevents the operator from holding it firmly while he is cutting. The manner of using it is, by passing the thumb through the ring, and supporting it with the fore finger, while the straight-edged knife is to slide along the groove with its edge upwards, towards the extremity of the abscess.

B. The straight-edged knife, proper for opening abscesses with the assistance of a director; but which, in few other respects, is preferable to the round-edged knife.

C. A crooked needle, with its convex and concave sides sharp.
Surgery

When a wound is recent, and the parts of it are divided by a sharp instrument, without any farther violence, and in such a manner that they may be made to approach each other, by being returned with the hands, they will, if held in close contact for some time, reunite by inosculatation, and cement like one branch of a tree ingrafted on another. To maintain them in this situation, several sorts of sutures have been invented, and formerly practiced; but the number of them has of late been very much reduced. Those now chiefly described, are the interrupted, the glover's, the quilled, the twisted, and the dry sutures; but the interrupted and twisted, are almost the only useful ones; for the quilled suture is never preferable to the interrupted; the dry suture is ridiculous in terms, since it is only a piece of plaster applied in many different ways to reunite the lips of a wound; and the glover's, or uninterrupted stitch, which is advised in superficial wounds, to prevent the deformity of a scar, does rather, by the frequency of the stitches, occasion it, and is therefore to be rejected in favor of a compress and sticking plaster; the only instance where it should be used, is in a wound of the intestine.

Wounds are not fit subjects for suture, when there is either a contusion, laceration, loss of substance, great inflammation, difficulty of bringing the lips into apposition, or some extraneous body introducted into them; though sometimes a lacerated wound may be afficted with one or two stitches. It has formerly been forbidden to sew up wounds of the head; but this precaution is very little regarded by the moderns.

If we stitch up a wound that has none of these obstacles, we always employ the interrupted future, palling the needle two, three, or four times, in proportion to the length of it, though there can seldom be more than three stitches required.

The method of doing it is this: the wound being emptied of the grumous blood, and your assistant having brought the lips of it together, that they may lie quite even; you carefully carry your needle from without, inwards to the bottom, and fo on from within, outwards; using the caution of making the puncture far enough from the edge of the wound, which will not only facilitate the palling the ligature, but will also prevent it from eating through the skin and flesh; this distance may be three or four tenths of an inch: as many more stitches as you shall make, will be only repetitions of the same process. The threads being all palled, you begin tying them in the middle of the wound, though, if the lips are held carefully together all the while, as they should be, it will be of no great consequence which is done first. The most useful kind of knot in large wounds, is a single one first; over this, a little linen compres, on which is to be made another single knot; and then a slip-knot, which may be loosened upon any inflammation: but in small wounds, there is no danger from the double knot alone, without any compres to tie it upon; and this is most generally practised. If a violent inflammation should succeed, loosening the ligature only will not suffice; it must be cut through and drawn away, and the wound be treated afterwards without any future. When the wound is small, the lugs is it disturbed by dressing, the better; but in large ones, there will sometimes be a considerable discharge, and if the threads be not cautiously carried through the bottom of it, abscesses will frequently ensue from the matter being pent up underneath, and not finding issue. If no accident happen, you must, after the lips are firmly agglutinated, take away the ligatures, and dress the orifices which they leave.

It must be remembered, that during the cure, the future must be always afficted by the application of bandage, if possible, which is frequently of the greatest importance; and that sort of bandage with two heads, and a slit in the middle, which is by much the best, will in most cases be found practicable.

The twisted suture being principally employed in the hare lip, we shall reserve its description for the section on that head.

Of the Suture of Tendons.

Wounds of the tendons are not only known to heal again, but even to admit of sewing up like those of the fleshly parts,
parts, though they do not re-unite in so short a time. When a tendon is partly divided, it is generally attended with an excessive pain, inflammation, &c. in consequence of the remaining fibers being stretched and forced by the action of muscles, which necessarily will contract more when some of its resistance is taken away. To obviate this mischief, it has been hitherto an indisputable maxim in surgery, to cut the tendon quite through, and immediately afterwards perform the future. But this practice is not advisable; for though the division of the tendon afford present ease, yet the mere flexion of the joint will have the same effect: if, for example, it be a wound of a flexor tendon: besides, in order to few up the extremities of the tendon when divided, we are obliged to put the limb in such a situation, that they may be brought into contact, and even to sustain it in that posture to the finishing of the cure: if then, the posture will lay the tendon in this position, we can likewise keep it so without using the future, and are more sure of its not slipping away, which sometimes happens from any careless motion of the joint, when the stitches have almost worn through the lips of the wound; on which account, it is by all means advisable, in this case, to forbear the future, and only to favour the situation of the extremities of the tendon, by placing the limb properly.

But when the tendon is quite separated, and the ends are withdrawn from one another, having brought them together with your fingers, you may few them with a straight triangular pointed needle, paffing it from without inwards, and from within outwards in small tendons; about three tenths of an inch from their extremities, and in the *tendo Achillis* half an inch.

As the wound of the skin will be nearly traverse, it should not be raised to expose more of the tendon, but rather fewed up with it, which will conduct to the strength of the future. The knot of the ligature is to be made as in other wounds, and the dressings are to be the same: there is a sort of thin crooked needle that cuts on its concave and convex sides, which is very handy in the future of large tendons, and to be preferred to the straight one. During the cure, the dressings must be superficial, and the parts kept steady with pastboard and bandage: the small tendons reunite in three weeks, but the *tendo Achillis* requires six at least.

*Of the Gastroraphy.*

This word signifies no more than fewing up any wound of the belly; yet in common acceptance, it implies that the wound of the belly is complicated with another of the intestines. Now the symptoms laid down for distinguishing when the intestine is wounded, do not with any certainty determine it to be wounded only in one place; which want of information makes it absurd to open the abdomen in order to come at it: if so, the operation of fitching the bowels can only take place where they fall out of the abdomen, and we can see where the wound is, or how many wounds there are: if it happens that the intestines fall out unwounded, the burden of the surgeon is to return them immediately, without waiting for spirituous or emollient fomentations; and in case they puff up so as to prevent their reduction by the same orifice, you may with a knife or probe-sciar sufficiently dilate it for that purpose, or even prick them to let out the wind.

Upon the supposition of the intestine being wounded in such a manner as to require the operation, (for in small punctures it is not necessary,) the method of doing it may be this: Taking a straight needle with a small thread, you lay hold of the bowel with your left hand, and few up the wound by the glover's fitch, that is, by passing the needle through the lips of the wound, from within outwards all the way, so as to leave a length of thread at both ends, which are to hang out of the incision of the abdomen; then carefully making the interrupted future of the external wound, you pull the bowel by the small threads into contact with the peritoneum, in order to procure an adhesion, and tie them upon a small bolster of linen. In about six days, it is said the ligature of the intestine will be loofe enough to be cut and drawn away, which must be done without great force; in the interim, the wound is to be treated with superficial dressings, and the patient to be kept very still and low.

*Of the Bubonocele.*

When the intestine or omentum falls out of the abdomen into any part, the tumour in general is known by the name of *hermia*; which is farther specified either from the difference of situation, or the nature of its contents. When the intestine or omentum falls through the navel, it is called a *hermia umbilicalis*, or *exomphalos*; when through the rings of the abdominal muscles into the groin, *hermia inguinalis*; or if into the foramen, *ferotalis*: these two last, though the first only is properly fo called, are known by the name of bubonocele. When they fall under the *ligamentum Fallopian*, through the same passage that the iliac vessels creep into the thigh, it is called *hermia femoralis*. The bubonocele is also sometimes accompanied with a descent of the bladder: however, the case is very rare; but when it occurs, it is known by the patient's inability to urine, till the hernia of the bladder is reduced within the pelvis. With regard to the contents characterizing the swelling, it is thus distinguished: if the intestine only is fallen, it becomes an *enterocele*; if the omentum, (*epiplon*) *epiplocele*; and if both, *entero-epiplocele*. There is, besides these, another kind of hernia mentioned and described by the moderns, when the intestine or omentum is infinuated between the interlites of the muscles, in different parts of the belly: this hernia has derived its name from the place affected, and is called the *hermia ventralis*; and lastly, there have been a few instances, where the intestines or omentum have fallen thro' the great foramen of the ilium into the internal part of the thigh, between and under the two anterior heads of the triceps muscle.

All the kinds of hernias of the intestines and omentum, are owing to a preternatural dilatation of the particular orifices through which they pass, and not to a laceration of them.

The rupture of the groin, or *ferotum*, is the most common species of hernia, and in young children is very frequent; but it rarely happens in infancy, that any mischief arise from it. For the most part, the intestine returns of itself into the cavity of the abdomen, whenever the person lies down; at least a small degree of compression will make it. To secure the intestine when returned into its proper place, there are steel trusses now so artfully made, that by being accommodated exactly to the part, they perform the office of a bolster, without galling, or even fitting uneasy on the patient. These instruments are of so great service, that
were people who are subject to rupatures always to wear them, very few would die of this distemper: since it often appears, upon inquiry, when we perform the operation for the bubonoccele, that the necessity of the operation is owing to the neglect of wearing a trufs.

In the application of a trufs to these kinds of swellings, a great deal of judgment is sometimes necessary, and for want of it, we daily see trusses put even on buboes, induc- ted tertules, hydroctes, &c.

If there is a rupture of the integine only, it is, easily, when returned into the abdomen, supported by an instru- ment; but if of the omentum, notwithstanding it may be returned, yet the reduction felsion brings relief, unless there is only a small quantity of it; for the omentum will lie un- easily in a lump at the bottom of the belly, and, upon re- moval of the instrument, drop down again immediately; upon which account, seeing the little damage and pain there is in this kind of hernia, nothing need be used but a big trufs, to support the scrotum, and prevent possibly by that means the increase of the tumour. The difference of these tumours will be distinguished by the feel; that of the omentum feeling flaccid and rumpled, the other more even, flattulent, and springy.

Sometimes, in a rupture of both the integine and omen- tum, the gut may be reduced, but the omentum will still remain in the scrotum; and when thus circumstanced, a trufs must be used.

We have hitherto considered the rupture as moveable; but it happens frequently, that the integine, after it has passed the rings of the muscles, is partially inflamed, which enlarging the tumour, prevents the return of it into the ab- domen, and becoming every moment more and more strangLED, it soon tends to a mortification, unless we dilate the pasSages through which it is fallen, with some instrument, to suspend the scrotum, and prevent possibly by that means the increase of the tumour. The difference of these tumours will be distinguished by the feel; that of the omentum feeling flaccid and rumpled, the other more even, flattulent, and springy.

It rarely happens that patients submit to this incision be- fore the gut is mortified, and it is too late to do service; nor that there are instances of people surviving small gangrenes, and even perfectly recovering afterwards.

In mortifications of the bowels, when fallen out of the abdomen into the navel, it is not very uncommon for the whole gangrened integine to separate from the found one, so that the excrement must necessarily ever after be dis- charged at that orifice: there are likewise a few instances, where the rupture of the scrotum has mortified, and become the anus, the patient doing well in every other respect.

Before the performance of the operation for the bubono- ccele, it is only necessary to be done in the extremity of danger, the more methodical are to be tried; there are, such as will conduct to soothe the inflammation.

If, except the pleurisy, no disorder is more im- mediately relieved by plentiful bleeding than this. Clysters repeated, one after another, three or four times, if the fist or sore be either regained too long, or immediately re- turned, proves very efficacious; these are serviceable, not only as they empty the great intestines of their excrements and flatulences, which last are very dangerous, but they likewise prove a comfortable fomentation, by pulling thro' the colon all around the abdomen. The scrotum and groin musl, during the lay of the clyster, be bathed with warm fponges wrung out of a fomentation: and after the part has been well fomented, you must attempt to reduce the rub- ture: for this purpose, let your patient be laid on his back, so that his buttocks may be considerably above his head; the bowels will then retire towards the diaphragm, and give way to those which are to be pushed in. If, after endea- vouring two or three minutes, you do not find succeds, you may still repeat the trial.

If, notwithstanding these means, the patient continues in very great torture, though not so bad as to threaten an im- mediately mortification, we must apply some fome fort of poultice to the scrotum; such as equal parts of oil and vinegar made into a proper consists of oat-meal: after some few hours, the fomentation is to be repeated, and the other directions put in practice.

After all, should the pain and tenenencs of the part con- tinue, and hiccoughs and vomitings of the excresments suc- ceed, the operation must take place; for if you wait until a languid pulse, cold sweats, subfding of the tumour, and emphysematous feel come on, it will be most likely too late, as they are pretty sure symptoms of a mortification.

To conceive rightly of the occurrences in this operation, it must be remembered, that in every species of rupture, a portion of the peritoneum generally falls down with what- ever makes the hernia; which, from the circumstance of containing immediately the contents of the tumour, is called the sac of the hernia. Now, the portion of the peritoneum, which usuallly yields to the impulsion of the descending vif- cera, is that which corresponds with the inmost opening of the abdominal muscles, just where the membra pan cellularis peritonei begins to form the tunica vaginalis of the fpermatic cord; so that the sac with the vifcera infinuates them- selves into the tunica vaginalis of the fpermatic cord, and lie upon the tunica vaginalis of the tefticle: nevertheless, upon examination, the contents of the hernia are sometimes in contact with the tefticle itself; that is to say, within the tunica vaginalis of the tefticle. For some months during gestation, the teftes of the foetus remain in the abdomen; and when they descend into the tunica vaginalis, there is an immediate communication between the cavity of the abdo- men, and the cavity of the tunica vaginalis, which, in process of time, becomes obliterated by the coalition of the tunick with the cord; but if it happen, before the coalition be effected, that the integine or the omentum fall into the scrotum, they will necessarily remain in contact with the teftes.

From this description of the descent of the vifcera, it is evident that the herniary sac is contained within the tunica vaginalis, and ought to give the idea of one bag inclosing another: but in the operation, this distinction of coats does not always appear; for the herniary sac sometimes adheres so firmly to the tunica vaginalis, that together they make one thick coat: this adhesion may possibly result from the present inflammation of the parts, which has rendered the operation necessary.

The best way of laying your patient will be on a table about three feet four inches high, letting his legs hang down; then properly securing him, you begin your incision above the rings of the muscles, beyond the extremity of the tu- mour, and bring it down about half the length of the scro- tum, through the membra pan adiposa, which will require very little trouble to separate from the tunica vaginalis, and consequently will expose the rupture for the farther pro- cesses of the operation. If a large teftell is opened by the inci- sion, it must be taken up before you proceed further.

When
When the *tunica vaginalis* is laid bare, you must cut carefully through it and the *peritoneum*, in order to avoid pricking the intestines.

The *peritoneum* being cut through, we arrive to its contents, the nature of which will determine the next process: for if it is intestine only, it must directly be reduced; but if there is any mortified *omentum*, it must be cut off; in order to which it is advised to make a ligature above the part wounded, to prevent an hemorrhage; but it is quite needless, and in some meaure puerile, as it puckers up the intestine, and disfarms its situation, if made close to it.

When the *omentum* is removed, we next dilate the wound; to do which with safety, an infinite number of instruments have been invented: but there is none we can use in this case with so good management as a knife; and the finger in this operation is often a much better defence against pricking the bowels, than a director. The knife must be a little crooked and blunt at its extremity, like the end of a probe. Some surgeons perhaps may not be steady enough to cut dexterously with a knife, and may therefore perform the incision with probe-shears carefully introducing one blade between the intestine and circumference of the rings, and dilating upwards, and a little obliquely outwards. When the finger and knife only are employed, the manner of doing the operation will be by pricking the gut down with the fore-finger, and carrying the knife between it and the muscles, so as to dilate upwards about an inch, which will be a wound generally large enough: but if, upon examination, it shall appear that the intestine is strangulated within the *abdomen*, which may possibly happen from a contraction of the *peritoneum* near the entrance into the *fetum*; in that case, the incision must be continued through the length of the contracted channel, or the consequence will be fatal, notwithstanding the intestine be restored into the *fetum*: on this account the operator should pass his finger up the *fetum* into the abdomen, after the reduction of the gut, in order to discover whether it be safely returned into its proper place.

The opening being made, the intestine is gradually to be pulled into the *abdomen*, and the wound to be stitched up; for this purpose, some advise the quilted, and others the interrupted suture, to be passed through the skin and muscles; but as there is too much danger of the bowels falling out when a dressing and bandages are applied, and the patient all the white kept upon his back, but that it may be prevented by one or two short stitches through the skin only, it is by all means advisable to follow this method, since the security of a ligature in those tendinous parts may be dangerous.

Hitherto, in the description of the *bubonocele*, we have suppos'd the contents to be loose, or separato in the *fetum*: but it happens sometimes in an operation, that we find not only an adhesion of the outside of the *peritoneum* to the *tunica vaginalis*, and spermatique vessel, but likewise of some part of the intestines to its internal surface; and in this case there is so much confusion, that the operator is often obliged to extirpate the testes, in order to diffuse away and disentangle the gut; though if it can be done without calculation, it ought: however, this accident happens rarely, except in those ruptures that have been a long time in the *fetum* without returning: in which case the difficulty and hazard of the operation are so great, that, unless urged by the symptoms of an inflamed intestine, it should not be undertaken.

The dressing of the wound first of all may be with dry lint, and afterwards as directed under the head of wounds.

The operation of the *bubonocele* in women is nearly resembles that performed on men, that it requires no particular description: only in them the rupture is formed by the intestine or *omentum* falling down through the passage of the *ligamentum rotundum* into the groin, or one of the *labia pudenda*; where causing the same symptoms, as when obstructed in the *fetum*, it is to be returned by the dilatation of that passage.

**Of the Epiplocele.**

There have been a few instances where so great a quantity of the *omentum* has fallen into the *fetum,* that, by drawing the stomach and bowels downwards, it has excited vomitting, inflammation, and the same train of symptoms as happen in a *bubonocele*; in which case, the operation of opening of the *fetum* is necessary: the incision must be made in the manner of that for the rupture of the intestine, and the same rules observed with regard to the *omentum* that are laid down in the last section. It is necessary also, that the rings of the muscles should be dilated; or otherwise, though you have taken away some of the mortified part of the *omentum*, the rest that is out of its place, and tranquiled in the perforation, will gangrene also. The wound is to be treated in the same manner as that after the operation of the *bubonocele*.

**Of the Hernia Femoralis.**

This species of rupture is the same in both sexes, and formed by the falling of the *omentum* or intestine, or both of them, into the inside of the thigh, through the arch made by the *pubis* and *ligamentum Faltipiri*, where the saphenous and rendoms of the *fetum* and *iliacus internus* muscles pass from the *abdomen*. It is very necessary surgeons should be aware of the frequency of this disorder, which creates the same symptoms as other ruptures, and may first of all be treated by the same method: the manner of operating in the reduction is here too so exactly the same, with the difference of dilating the ligament instead of the rings of the muscles, that it would be a mere repetition of the operation for the *bubonocele* to give any description of it: only it may be observed, that the spermatique cord, as it enters into the *abdomen*, lies nearly transversely to the incision, and close in contact with the ligament; so that unless you make the dilatation obliquely upwards, instead of perpendicularly upwards, you will probably divide those vessels.

**Of the Exomphalos.**

This rupture is owing to a protrusion of the intestine, or *omentum*, or both of them, at the navel, and rarely happens to the subject of an operation: for though the case is common, yet most of them are gradually formed, from very small beginnings; and if they do not return into the *abdomen* upon lying down, in all probability they adhere without any great inconvenience to the patient, till some time or other an inflammation falls upon the intestines, which soon brings on a mortification, and death; unless, by great chance, the mortified part separates from the found one, leaving its extremity to perform the office of an *anus*; in this emergency, however, it is advisable to attempt the reduction, if called in at the beginning, though the universal adhesion of the *fetum* and its contents are a great obstacle to the success of the
the influence in which it is most likely to answer, is, when the rupture is owing to any strain, or sudden jerk, and is attended with these disorders which follow upon the irruption of a gut.

In this case, having tried all other means in vain, the operation is absolutely necessary; which may be thus performed: Make the incision somewhat above the tumour, on the left side of the navel, through the membrana adiposa, and then emptying the fat of its water, or mortifiedomentum, dilate the ring with the same crooked knife, conducted on your finger, as in the operation for the bubonocele; after this, return the intestines and omentum into the abdomen, and drees the wound without making any ligature but of the skin only.

Of the Hernia Ventralis.

The hernia ventralis, which sometimes appears between the recti muscles, is very large; but that tumour which requires the operation is seldom bigger than a walnut, and is a disease not so common as to have been observed by many but there are cases enough known, to put a surgeon upon inquiry after it. When the patient is suddenly taken with all the symptoms of a rupture, without any appearance upon inquiry after it. When the patient is suddenly taken with all the symptoms of a rupture, without any appearance

Explanalion of Fig. 2. Plate CLVII.

A. The round-edged knife, of a convenient size for almost all operations where a knife is used: the make of it will be better understood by the figure than any other description; only it may be remarked, that the handle is made of a light wood, as indeed the handles of all instruments should be, that the resistance to the blades may be better felt by the surgeon.

B. A pair of probe-scissors, which require nothing very particular in their form, but that the lower blade should be made as small as possible, so that it is strong, and has a good edge; because, being chiefly used in fistulas in ano, the introduction of a thick blade into the fistula, which is generally narrow, would be very painful to the patient.

C. The crooked knife with the point blunted, used in the operation of the bubonocele.

Of the Hydrocele.

The hydrocele, called also hernia aquosa, hydroscroti, and hydrostefis, is a watery tumour of the scrotum; which, notwithstanding the multiplicity of dilatations used by writers, is but of two kinds, the one when the water is contained in the tunica vaginalis, and the other when in the membrana cellularis scroti. This last is almost always complicated with an aniseke; which species of dropy is an extravasation of water lodged in the cells of the membrana adiposa; and when thus circumstanced, will not be difficult to be distinguished; besides that it is sufficiently characterized by the shining and softness of the skin, which gives way to the least impression, and remains pitted for some time. The penis is likewise sometimes enormously enlarged, by the inflation of the fluids into the membrana cellularis; all which symptoms are absolutely wanting in the dropy of the tunica vaginalis.

In the dropy of the membrana cellularis scroti, the puncture with the trocar is recommended by some, and little oriﬁces made here and there with the point of a lancet by others; or a small skene of silk passed by a needle through the skin, and out again at the distance of two or three inches, to be kept in the manner of a seton, till the waters be quite drained: but the two first methods avail very little, as they open but few cells; and the last cannot be so instructive in that respect as incisions, and will be much more apt to become troublesome, and even to gangrene.

Indeed it is not often proper to perform any operation at all upon this part, since the membrana cellularis scroti, being a continuation of the membrana adiposa, oriﬁces made through the skin in the small of the legs will effectually empty the scrotum; and this place ought rather to be pitched upon than the other, as being more likely to answer the purpose by reason of its dependency: however, it sometimes happens, that the waters fall in so great quantities into the scrotum, as, by difteading it, to occasion great pain, and threaten a mortification; the prepuce of the penis also becomes very often excessively dilated, and so twisted, that the patient cannot void his urine. In these two instances, an incision of three inches long should be made on each side of the scrotum, quite through the skin into the cells containing the water, and two or three of half an inch long, in any part of the penis, with a lancet or knife; all which may be done with great safety, and sometimes with the success of carrying off the disease of the whole body.

The dropy of the tunica vaginalis is owing to a preternatural discharge of that which is continually separating in a small quantity, on the internal surface of the tunick, for the moistening or lubricating the tefficle, and which collecting too fast accumulates and forms in time a swelling of great magnitude; this is what we take to be the other species of hydrocele, and the only one besides.

The hydrocele of the tunica vaginalis is very easily to be distinguished from the hydrocele of the membrana cellularis, by the preceding description of that species of dropy. We shall now explain how it differs from the other tumours of the scrotum, viz. the bubonocele, epiplocele, and enlarged tefficle. In the first place, it is seldom or never attended with pain in the beginning, and is very rarely to be imputed to any accident, as the hernia’s of the omentum and intestines are. From the time it first makes its appearance, it is very seldom known to appear or diminish; but generally continues to increase, though in some much faster than in others; in one person growing to a very painful diffusion in a few months, whilst in another it shall not be troublesome in many years; nay, shall cease to swell at a certain period, and ever after continue in that state without any notable disadvantage; though this last case very rarely happens. In proportion as it enlarges, it becomes more tense, and then is said to be transparent; indeed the transparency is made the chief criterion of the disease; it being constantly advised to hold a candle on one side of the scrotum, which it is said will shine through the other side, if there be water. But this experiment does not always answer, because sometimes the tunica vaginalis is very much thickened, and sometimes the water itself is not transparent; so that to judge positively if there be a fluid, we must be guided by feeling a fluctuation; and
and though we do not perhaps evidently perceive it, yet we may be persuaded there is a fluid of some kind, if we are once assured that the distension of the tunica vaginalis makes the tumour; which is to be distinguished in the following manner.

If the interstitial, or omentum, form the swelling, they will be soft and pliable, (unless inflamed;) uneven in their surface, particularly the omentum; and both of them extend themselves up from the serotum quite into the very abdomen: whereas, in the hydrocele, the tumour is tenser and smooth, and ceases before or at its arrival to the rings of the abdominal muscles: because the upper extremity of the tunica vaginalis terminates at some distance from the surface of the belly.

When the testicle is increased in its size, the tumour is rounder; and if not attended with an enlargement of the spermatic vessels, the cord may be easily distinguished between the swelling and abdomen; but without this rule of distinction, either the pain, or the very great hardness, will discover it to be a disease of the testicle.

As to the cure of this distemper by external applications, or internal means, little is to be expected; on which account, it is generally advisable to wait with patience until the tumour becomes troublesome; and then to tap it with a lancet or trocar. In opening with a lancet, it may possibly happen, that the orifice of the skin shall slip away from that of the tunica, and prevent the escape of the water to obviate which inconvenience, you may introduce a probe, and by that means secure the exact situation of the wound; but if the coats are very much thickened, it will be advisable to use the trocar, rather than the lancet. It is spoken of as an easy thing, to hold the testicle with the left hand, while we make the puncture with the right; but when the tunica vaginalis is very tense, it cannot well be distinguished: however, there is no danger of wounding it, if you make the puncture in the inferior part of the serotum. During the evacuation, the serotum must be regularly pressed; and after the operation, a little piece of dry lint and sticking plaster are sufficient.

This method of tapping is called the palliative cure; not but that it does now and then prove an absolute one. To prevent the relapse of this disease, surgeons prescribe the making a large wound, either by incision or caustic, that upon healing it afterwards, the firmness and contraction of the cicatrix may bind up the relaxed lymphatic vessels, and obstruct the further preternatural effusion of their contents; but this practice is generally attended with so much trouble, that, notwithstanding its success in the end, most surgeons prefer the palliative.

Of Castration.

This is one of the most melancholy operations in the practice of surgery, since it seldom takes place but in disorders into which the patient is very apt to relapse, viz. those of a febrirhus, or cancer: for under most of the symptoms described as rendering it necessary, it is absolutely improper; such as a hydrocele, abscesses of the testis, an increasing mortification, or what is sometimes understood by a farcocele; of which last it may not be amiss to say a word. In the utmost latitude of the meaning of this term, it is received as a fleshly swelling of the testicle itself, called likewise hernia canena; or in some enlargements, such as in a clam, more frequently hernia humoralis; but generally speaking, is considered as a fleshly excrecence formed on the body of the testis, which becoming exceedingly hard and tumefied, for the most part is supposed to demand extirpation, either by cutting or burning away the induration, or amputating the testicle. But this maxim too precipitately received, has very much misguided the practitioners of surgery.

It sometimes happens that the epidydymis is tumefied, independent of the testicle; and feeling like a large adventitious excrecence, answers very well to the idea most surgeons form of a farcocele: but not being aware of the different nature and texture of the epidydymis, they have frequently confounded its disorders with those of the testicle itself, and equally recommended extirpation in the induration of one or the other. But all indurations of the glandular part of the testicle not tending to inflammation and abscesses, generally, if not always, lead on to farcohus and cancers; whereas those of the epidymis seldom or never do. It is true, in spite of internal or external means, these last often retain their hardness, and sometimes suppurate, but however without much danger in either case.

Before castration, it is laid down as a rule to inquire whether the patient has any pain in his back, and in that case to reject the operation, upon the reasonable presumption of the spermatic vessels being likewise diseased; but we are not to be too hasty in this determination; for the mere weight of the tumour stretching the cord, will sometimes create this complaint. To learn the cause then of this pain in the back, when the spermatic cord is not thickened, let your patient keep his bed, and suspend his serotum in a bag-truss, which will relieve him, if disordered by the weight only; but if the spermatic cord is thickened or indurated, which rarely, when attended with a dilatation of the vessels of the serotum, is known by the Greek appellations cirrocele and varicocele, the case is desperate, and not to be undertaken.

But supposing no obstacle in the way to the operation, the method of doing it may be this: Lay your patient on a square table of about three feet four inches high, letting his legs hang down, which, as well as the rest of his body, must be held firm by the assistants. Then with a knife begin your wound above the rings of the abdominal muscles, that you may have room afterwards to tie the vessels, since for want of this caution operators will necessarily be embarrassed in making the ligature: then carrying it through the membrana adiposa, it must be continued downward, the length of it being in proportion to the size of the testicle.

If it is very small, it may be dissected away without taking any part of the serotum. If the testicle, for instance, weighs twenty ounces; having made one incision about five inches long, a little circularly, begin a second in the same point as the first, bringing it with an opposite sweep to meet the other in the inferior part, in such a manner as to cut out the shape of an oval whose smallest diameter shall be two inches: after this, dissect away the body of the tumour, with the piece of skin on it, from the serotum; first taking up some of the blood-vessels, if the hemorrhage is dangerous. Then pass a ligature round the cord, pretty near the abdomen, and if you have space between the ligature and testicle, a second about half an inch lower, to make the slippage of blood still more secure. The ligatures may be tied with what is called the surgeon's knot, where the thread is palled through the ring twice. This done, cut off the testicle a little underneath the second ligature, and pass a needle from the skin at the lower part of the wound through the skin at the upper part, in such a manner as to envelope in some
some degree the sound tactual, which will greatly facilitate and quicken the cure; or if one stitch will not answer the purpose, you may repeat it in such part of the wound where the skin on each side lies most loose.

In large tumours, it is advisable to cut away great part of the skin; for besides that the haemorrhage will be much less in this case, and the operation greatly shortened, the skin by the great distention having been rendered very thin, will great part of it, if not taken away, spackleate, and the rent be more prone to degenerate into a cancerous ulcer.

Of the Phymosis.

The phymosis signifies no more than such a straithness of the prepucce, that the glans cannot be denuded; which is the greatest it becomes troublesome, so as to prevent the egress of the urine, or conceal under it chances, or foul ulcers, quite out of the reach of application, is to be cut open. It sometimes happens, that children are born imperfect; in which case, a small puncture, dressed afterwards with a test, effects a cure. But this operation is chiefly practised in venereal cases, in order to expose chances either on the glans or within the prepucce itself: and here, if the prepucce is not very callous and thick, a mere incision will answer; which may be made either with the tiff harassing, or by slitting a knife between the skin and glans to the utmost extremity, and cutting it up; the last method is more easy than that of the cutting, but it is better to make the wound on the side of the prepucce than upon the upper part, for sometimes the great vessels on the dorsum penis afford a terrible haemorrhage; though the prepucce remains better slitted after an incision made in the upper part, and therefore is to be preferred by those who understand how to take up the vessels. In children it sometimes happens that the prepucce becomes very much contracted; and in that case, it is accidentally subiect to flight inflammations, which bring on some symptoms of the stone; but the disorder is always removed by the cure of the phymosis.

If the prepucce be very large and indurated, the opening alone will not suffice; and it is more advisable to take away the callosity by circumcision, which must be performed with a knife; and if the artery bleed much, it must be taken up with a small needle and ligature.

Of the Paraphymosis.

The paraphymosis is a disease of the penis, where the prepucce is fallen back from the glans, and cannot be brought forwards to cover it. There are many whose penis is naturally thus formed, but without any inconvenience; so that since the time of the Romans, (some of whom thought it indecent to have the glans bare,) it has not been usual to perform any operation upon that account; but we read the several processes of it described particularly by Celsus, who does not speak of it as an uncommon thing. Moit of the instances of this disease are owing to a venereal cause; but there are some where the prepucce is naturally very tight, which take their rise from a sudden retraction of it, and immediate enlargemen of the glans preventing its return. Sometimes it happens that the surgeon succeeds in the reduction immediately, by compressing the extremity of the penis, at the time he is endeavouring to advance the prepucce; if he does not, let him keep it suspended, and attempt again, after having somented, and used some emollient applications: but if, from the contraction below the corona glandis, there is so great a strititure as to threaten a gangrene, or even, if the penis is much enlarged by water in the membrane reticularis, forming tumours called crystallines, three or four small incisions must be made with the point of a lancet, into the strititure and crystallines, according to the direction of the penis; which in the first case will set free the obstruction, and in the other evacuate the water: the manner of dressing afterwards must be with fomentations, digestives, and the siberica Londinensis over the pledgits.

Of the Paracentesis.

This operation is an opening made into the abdomen, in order to empty any quantity of extravasated water, collected in that species of dropfy called the ascites; but as there is much more difficulty in learning when to perform than how to perform it, and indeed in some instances requires the nicest judgment, we shall endeavour to specify the distinctions which render the undertaking more or less proper.

There are but two kinds of dropsey; the ascites, called also leucophlegmacy, when the extravasated water swells in the cells of the membrane adiposa; and the ascites, when the water poises the cavity of the abdomen. In the first kind, the water is clear and limpid; but in the second, a little groffer, very often gelatinous and corrupted, and sometimes even mixed with fleshy concretions.

The operation of tapping is seldom the cure of the distemper: but dropsey, which are the consequence of a mere impoverishment of the blood, are less likely to return than those which are owing to any previous disorder of the liver; and it is not uncommon for dropseys that follow agues, haemorrhages, and diarrhoeas to do well; whereas in such as are complicate with a surrefous liver, there is hardly an example of a cure.

The water floating in the belly, is, by its fluctuation, to determine whether the operation be advisable; for if, by laying one hand on any part of the abdomen, you cannot feel an undulation from striking on an opposite part with the other, it is to be presumed there will be some obstacle to the evacuation. It sometimes happens, that a great quantity, or almost all the water, is contained in little bladders, adhering to the liver and the surface of the peritoneum, known by the name of hydatids; and the rest of it in different sized ones, from the degree of a hydatis, to the size of a globe holding half a pint or a pint of water. This is called the encysted dropsey, and from the smallness of its cysts makes the operation useful; but is not difficult to be distinguished, because there is not a fluctuation of the water, unless it is complicated with an extravasation.

When the fluctuation is hardly perceptible, (except the teguments of the abdomen are very much thickened by an ascites,) in all probability the fluid is gelatinous.

There is another kind of dropsey, which for the most part forbids the operation, and is peculiar to women, being feet in the body of one or both ovaries. There is no example of this species but what may be known by the hardness and irregularity of the tumour of the abdomen, which is nearly uniform in the other cases.

When the ovary is dropical, the water is generally deposited in a great number of cells formed in the body of it; which circumstance makes the fluctuation insensible, and the perforation useless; though sometimes there are only one or two.
two cells; in which case, if the ovary is greatly magnified, the undulation will be readily felt, and the operation be advisable.

When the ascites and anasarca are complicated, it is seldom proper to perform the operation, since the water may be more effectually evacuated by scarifications in the legs than by tapping.

Upon the supposition nothing forbids the extraction of the water, the manner of operating is this: Having placed the patient in a chair of a convenient height, let him join his hands so as to press upon his stomach; then dipping the trocar in oil, you stab it suddenly through the teguments, and, withdrawing the perforator, leave the waters to empty by the canula: the abdomen being, when filled, in the circumstance of a bladder distended with a fluid, would make it indifferent where to wound; but the apprehension of hurting the liver, if it be much enlarged, has induced operators rather to choose the left side, and generally in that part which is about three inches obliquely below the navel; if the navel protuberates, you may make a small puncture with a lancet in the skin, and the waters will be readily voided by that orifice, without any danger of a hernia succeeding; but it should be carefully attended to, whether the protuberance is formed by the water or an exomphalos; in which latter case, the intestines would be wounded, and not without the greatest danger. The surgeon neither in operating with the lancet, nor perforating with the trocar, need fear injuring the intestines, unless there is but little water in the abdomen, since they are too much confined by the membrane to come within reach of danger from these instruments; but it sometimes happens that when the water is almost all emptied, it is suddenly stopped by the intestines pressing against the end of the canula; in which case you may pull them away with a probe: during the evacuation, your attendants must keep pressing on each side of the abdomen, with a force equal to that of the waters being empty, lest the protuberance is formed by the water or an exomphalos, in which latter case, the intestines would be wounded, and not without the greatest danger. The surgeon neither in operating with the lancet, nor perforating with the trocar, need fear injuring the intestines, unless there is but little water in the abdomen, since they are too much confined by the membrane to come within reach of danger from these instruments; but it sometimes happens that when the water is almost all emptied, it is suddenly stopped by the intestines pressing against the end of the canula; in which case you may pull them away with a probe: during the evacuation, your attendants must keep pressing on each side of the abdomen, with a force equal to that of the waters before contained there; for by neglecting this rule, the patient will be apt to fall into faintings, from the weight on the abdomen, with a force equal to that of the waters being empty, leaves the superior ones of a hidden too empty, and thus interrupts the regular progress of the circulation. To obviate this inconvenience, the compression must not only be made with the hands during the operation, but be afterwards continued, by swathing the abdomen with a roller of flannel, about eight yards long, and five inches broad, beginning at the bottom of the belly, so that the intestines may be borne up against the diaphragm: you may change the roller every day till the third or fourth day, by which time the several parts will have acquired their due tone. For the drefsing a piece of dry lint and plaster suffices; but between the skin and roller it must be proper to lay a double flannel a foot square, dipp'd in brandy or spirits of wine.

This operation, though it does not often absolutely cure, yet it sometimes preserves life a great many years, and even a pleasant one, especially if the waters have been long collecting.

Explanation of Fig. 3. Plate CLVII.

A. A trocar of the most convenient size for emptying the abdomen when the water is not gelatinous. It is here represented with the perforator in the canula, just as it is placed when we perform the operation.

B. The canula of a large trocar, recommended in cases where the water is gelatinous.

C. The perforator of the large trocar.

The handle of the trocar is generally made of wood, the canula of silver, and the perforator of steel. Great care should be taken by the makers of this instrument, that the perforator should exactly fill up the cavity of the canula; for unless the extremity of the canula lies quite close and smooth on the perforator, the introduction of it into the abdomen will be very painful. To make it slip in more easily, the edge of the extremity of the canula should be thin and sharp; and that the canula should be of steel; for the silver one being of too soft a metal, becomes jagg'd or bruised at its extremity with very little use.

Of the Fistula in Ano.

The fistula in ano is an abscess running upon or into the integumentum rectum.

The piles, which are little tumours formed about the verge of the anus, immediately within the membrane interna of the rectum, do sometimes sappurite, and become the forerunners of a large abscess; also external injuries here, as in every other part of the body, may produce it; but from whatever cause the abscess arise, the manner of operating upon it will be according to the nature and direction of its cavity.

If the surgeon have the first management of the abscess, and there appear an external inflammation upon one side of the buttock only; after having waited for the proper maturity, let him with a knife make an incision the whole length of it; and in all probability, even though the bladder be affected, the lacerations of the wound, and the proper application of dressings lightly pressed in, will prevent the putrefaction of the integument, and make the cavity fill up like impol鞠imations of other parts.

If the fistula be continued to the other buttock, almost round the integument, the whole course of it must be dilated in like manner; hence, in such spongy cavities, a generation of fleas cannot be procured but by large openings; whence also, if the skin is very thin, lying loose and flabby over the fistula, it is absolutely necessary to cut it quite away, or the patient will be apt to sink under the discharge, which, in the circumstance here described, is sometimes exccellive. By this method, which cannot be too much recommended, it is amazing how happy the event is likely to be; whereas, from neglecting it, and trifling only to a narrow opening, if the discharge do not destroy the patient, at least the matter, by being confined, corrupts the gut, and infinuating itself about it, forms many other channels, which, running in various directions often baffle an operator, and have been the cause of a fistula being to generally esteemed very difficult of cure.

Here we have considered the impol鞠imation as poffessing a great part of the buttock; but it more frequently happens, that the matter points with a small extent of inflammation on the skin, and the direction of the fistula is even with the gut: in this case, having made a puncture, you may with a probe learn if it has penetrated into the intestine, by passing your finger up it, and feeling the probe introduced through the wound into its cavity; though, for the most part, it may
be known by a discharge of matter from the anus. When this is the state of the fistula, there is no hesitation to be made; but immediately putting one blade of the scissors up to the gut, and the other up the wound, snip the whole length of it. This process is as advisable when the intestine is not perforated, if the sinus is narrow, and runs upon or very near it; for if the abcefs be tented, which is the only way of dressing it while the external orifice is small, it will almost certainly grow callous; so that the safest means of cure, will be opening the gut, that proper applications may be laid to the bottom of the wound. However, it should be well attended to, that some patience pretty near the intestine neither run into nor upon it; in which case, they must be opened, according to the course of their penetration. There are abundance of instances, where the intestine is so much ulcerated, as to give free issue to the matter of the abcefs by the anus: but there are none where there is not, by the thinness and discolouration of the skin, or an induration to be perceived through the skin, some mark of its direction; which, if discovered, may be opened into with a lancet, and then it becomes the same case as if the matter had fairly pointed.

If the sinus into and about the gut are not complicated with an induration, and you can follow their course; the mere opening with scissors, or a knife guided on a director, will sometimes suffice; but it is generally safer to cut the piece of flesh surrounded by these inflations quite away, and, when it is callous, absolutely necessary, or the callousities must be walled afterwards by echinostick medicines, which is a tedious and cruel method of cure.

When the fistula is of a long standing, and we have choice of time for opening it, a dose of rhubarb the day before the operation will be very convenient, as it not only will empty the bowels, but also prove an antirheumatic for a while, and prevent the mischief of removing the dressings in order to go to stool.

It sometimes happens, that the orifices are so small, as not to admit the entrance of the scissors; in which case, sponge tents must be employed for their dilatation.

In performing these operations on the anus, no instruments are so handy as the knife and scissors; almost all the others which have been invented to facilitate the work are not only difficult to manage, but more painful to the patient: however, in those instances where the fistula is very narrow, and opens into the intestines, just within the verge of the anus, the syringotomy may be used with advantage; but where the opening into the gut is high, it cannot be employed without giving great pain.

The worst species of fistula is that communicating with the urethra, and sometimes through the prostate gland, with the bladder itself. This generally takes its rise from a former gonorrhoea, and appears externally first in perineum, and afterwards increases more towards the anus, and even sometimes into the groin, bursts out in various orifices, through the skin, which soon becomes callous and rotten; and the urine passing partly through these orifices, will often excite as much pain, and of the same kind, as a stone in the bladder.

This species of fistula, taking its rise from strictures of the urethra, is only manageable by the bougie: for so long as the urethra is obstructed, the cure of the fistula will be imperfect; but if the canal be opened by this application, it is amazing what obdurate indurations and foul sinuses will in consequence disappear; though there are some so callous and rotten, as to demand the knife and skilful dressings, notwithstanding the urethra should be dilated by the use of bougies.

Of the Puncture of the Perineum.

This operation is performed, when the bladder is under such a suppression of urine, as cannot be relieved by any gentler methods, nor, by reason of the obstruction in its neck or the urethra, will admit of the introduction of a catheter. The manner of doing it, as described by most writers, is by pulling a common trocar from the place where the external wound in the old way of cutting is made, into the cavity of the bladder, and so procuring the issue of the water through the canula; but others, refining upon this practice, have ordered an incision to be carried on from the fame part into the bladder, and then to infiltrate the canula: but both the methods are to be rejected, in favour of an opening a little above the os pubis; for besides that it is not easy to guide the instrument through the prostate gland into the bladder, the necessity of continuing it, in a part already very much inflamed and thickened, seldom fails to do mischief, and even to produce a mortification.

There is another method still more easy both to the patient and the operator; which consists only in emptying the bladder with a common trocar. and lopping the canula with a little cork, which is afterwards to be taken out as often as the patient has occasion to urine. The canula is to be continued in the bladder, till such time as the person finds he can void his urine by the natural passage.

In this operation the abdomen ought to be perforated about two inches above the os pubis; and if the patient be fat, the trocar should penetrate two inches, otherwise an inch and a half will be sufficient.

Of the Stone.

Stony concretions are a disagreeable incident to several parts of the body; but we shall treat only of those formed in the kidneys and bladder.

Small stones and gravel are frequently voided without pain; but sometimes they collect and become very large in the kidneys; in which case, a fit of the stone in that part is the cure, from the inflammation and pain occasioning convulsive twitches, which at last expel them. But in this disagreeable the patient is very much relieved by several kinds of remedies, such as the mucilaginous, the faponaceous, &c. some of which lubricate, and others both lubricate and stimulare. The sand, in passing through the ureters, is very much forwarded by the force of the urine. The ureters being very narrow as they run over the psoas muscle, and also at their entrance into the bladder, make the movement of the stone very painful and difficult in those parts; but there is seldom so much trouble after the first fit; for when once they have been dilated, they generally continue so. For the symptoms of a stone in the bladder, see Medicine, p. 122.

Of Searching.

The patient being laid on a horizontal table, with his thighs elevated and a little extended, place the sound with the concave part towards you, until it meets with some resistance in perineum, a little above the anus; then turning it without much force, pull it gently on into the bladder; and if...
if it meets with an obstruction at the neck, raise its extremity upwards, by inclining the handle of it towards you; or if it don't then slip in, withdraw it a quarter of an inch, and introducing your fore finger into the rectum, lift it up, and it will seldom fail to enter: there is some art in turning the found in the proper place of the urethra, which forgoons not vered in this operation cannot so well execute; therefore they may pass the instrument with the concave side always towards the abdomen of the patient, observing the fame rule at the entrance into the bladder as in the other method. The case of this obstacle, besides the rule of the urethra, and the reluctance of the verumontanum, is sometimes a small projection of the orifice of the bladder, in the urethra, like that of the ostium in the vagina, which occasions the end of the found to flip a little beyond it.

Though, upon searching, we are assured of a stone in the bladder, we are not, without further inquiry, to operate immediately; since there are sometimes obstacles which forbid the operation, either absolutely, or only for a certain time; among these, that of greatest consequence, is the gravel or stone in the kidneys. The objections of less weight, and which frequently are removed, are a fit of the stone, a cough, a hectic, and being emaciated by long pain; excessive hot or cold weather are likewise hindrances: But in extremity of danger, these last considerations may be disregarded.

Difference of age makes an extreme difference of danger, infants and young people almost always recovering; but still the operation is adviseable on those advanced in years, tho' it is not attended with near the same success. This operation is performed four several ways, all which we shall describe.

Of the Lesser Apparatus, or Cutting on the Gripe.

The most ancient way of cutting for the stone, is that described by Celsus, and known by the name of cutting on the gries; though, since the time of Johannes de Romans, it is also called cutting with the lesser apparatus, to distinguish it from his new method, which, on account of the many instruments employed in it, is called cutting with the greater apparatus. The manner of doing the operation is this: You first introduce the fore finger and middle finger of the left hand, dip't in oil, up the anus, and pressing softly with your right hand above the ostium, endeavor to bring the stone towards the neck of the bladder; then making an incision, on the left side of the perineum, above the anus, directly upon the stone, you turn it out through the wound, either with your fingers or a scoop.

This way of cutting was attended with many difficulties, for want of proper instruments to direct the incision, and extract the stone, when it lay beyond the reach of the fingers, which in a large bladder was frequently the case.

The wound of the bladder in this operation is made in the same place as is now practised in the later method; but it being impracticable on some subjects, and uncertain on all others, has made it universally exploded.

Of the Greater Apparatus, or the Old way.

This method of cutting, invented by Johannes de Romans, has at different times, and with different people, varied considerably in some of its proceedings, and particularly with regard to the use of certain instruments. What we shall describe, will be the manner in which it is now practised with all its improvements.

Having laid the patient on a square horizontal table, three feet four inches high, with a pillow under his head, let his legs and thighs be bent, and his heels made to approach his buttocks, by tying his hands to the bottom of his feet, with a couple of strong ligatures, about two yards long; and to secure him more effectually from struggling, pass a double ligature under one of his hams, and carry the four ligurs round his neck to the other ham; then passing the loop underneath it, make a knot by threading one of the single ends through the loop: After this, the thighs being widened from each other, and firmly supported by proper persons, you introduce the staff, having first dip't it in oil, which must be held by your assistant, a little leaning on the left side of the fomn in perineo; and beginning the external wound juft below the corrected, (which must be held out of the way,) you continue it downwards, to within two fingers breadth of the anus; then leaving that direction, you slip the knife forwards in the groove, pretty far into the bulbous part of the urethra; or, as there is some danger of wounding the rectum, in the continuation of the incision, you may turn the knife with the back towards it, and make this part of the incision from within outwards. Should a very large vesel be cut, it will be advisable to tie it before you proceed any farther in the operation. When the wound is made, slide the gorget along the groove of the staff into the bladder; and to do it with more safety, when the back of it is received in the groove, it will be proper to take the staff yourself in your hand; for if the assistant should, unwarily, either incline the handle of it too much towards you, or not refift enough to the force of the gorget, it is very apt to slip out of the groove, between the rectum and the bladder; which accident is not only inconvenient to the operator for the present, but is attended for the most part with very bad conquences. The gorget being pass'd, dilate the urethra and neck of the bladder with your fore-finger, and introduce the forces into the bladder, keeping them that till you touch the stone, when you must grasp it with a moderate force, and extract it by pulling downwards towards the rectum. Should you find a difficulty in laying hold of the stone, be careful to keep your forces in such a position, that they may open upwards and downwards, (not laterally,) which will very much facilitate the embracing of the stone, in case it should happen to be thin and flat.

Of the High Operation.

This method of cutting for the stone was first published in the year 1561, by Pierre Franco. About the year 1719, it was first done in England by Mr Douglas, and after him practised by others. The manner of performing it, with the improvements made since Franco's operation, is this: The patient being laid on a square table, with his legs hanging over, and fastened to the sides of it by a ligature pass'd above the knee; his head and body lifted up a little by pillows, so as to relax the abdominal muscles; and his hands held steady by some assistants; inject through a catheter into the bladder as much barley-water as he can bear, which in a man is often about eight ounces, and sometimes, twelve. For the more easily doing this, an ox's urether may be tied to the extremity of the syringe; and handle of the catheter,
the reflux of the water, must grasp the penis the moment the catheter is withdrawn, holding it on one side, in such a manner as not to stretch the skin of the abdomen; then with a round edged knife make an incision about four inches long, between the recti and pyramidal muscles, through the membrane adiposa, as deep as the bladder, bringing its extremity almost down to the penis; after which, taking a crooked knife, continue the incision into the bladder, carrying it a little under the os pubis, and immediately upon the water's flowing out, introduce the fore-finger of your left hand, which will direct the forceps to the stone.

This method was at first received with great applause in London; but after some trial was rejected, for the following inconveniences.

It sometimes happens that the bladder, notwithstanding the injection, still continues so deep under the os pubis, that the peritoneum being necessarily wounded first, the intestines push out immediately at the orifice, and the urine afterwards empties into the abdomen; in which case, hardly any recover. The injection itself is exceedingly painful; and however slowly the fluid be injected, it diffuses the bladder much more suddenly than the urine from the kidneys does, and so much faster than it can well bear, that it not only is seldom dilated enough to make the operation absolutely secure, but is sometimes even burst, or at least its tone destroyed by the daily dilatation. What adds to the danger here, is the possibility of meeting with a contracted indurated bladder; which is a circumstance sometimes attending on the stone, and indeed an exceedingly dangerous one in all the other methods; but would be frightful in this, by reason not only of the necessity of wounding the peritoneum, but of the difficulty of coming at the stone. If the stone be very small, it is hard to lay hold of it with the forceps, and in a fat man the fingers are not long enough for that purpose. If there are many little stones, it will scarce happen that more than one at a time can be extracted; and if the stone breaks, it not only is impracticable to take it all away in the operation, but also, from the supine posture of the patient, it will generally remain in the bladder; whereas, in the other methods, for the most part, it works itself out with the urine. But even supposing that the operation itself is prosperous, the confquences generally are very troublesome; for the urine seeping out at an orifice where there is no defect, spreads itself upon the abdomen, and makes very painful excoriations; though, what is still worse, it sometimes infiltrates itself into the cells between the bladder and abdominal muscles, and, together with the inflammation excited by the operation, brings on a suppuration there, which is always difficult to manage, and frequently mortal.

Of the Lateral Operation.

This method was invented by an ecclesiastic, who called himself Frere Jaques. He came to Paris in the year 1697, bringing with him an abundance of certificates of his dexterity in opening; and making his history known to the court, and magistrates of the city, he got an order to cut at the Hotel Dieu, and the Choisit, where he performed this operation on about fifty persons. His success did not answer the promises he had made.

The principal defect in his manner of cutting was the want of a groove in his staff; which made it difficult to carry the knife exactly into the bladder; nor did he take any care of his patients after the operation; so that for want of proper dressings, some of the wounds proved fistulous, and other ill consequences ensued.

Chelfelden, improving Frere Jaques's method, made use of the following, which is now the practice of most operators.

The patient being laid on a table, with his hands and feet tied, and the staff passed as in the old way, let your assistant hold it a little slanting on one side, so that the direction of it may run exactly through the middle of the left erector penis and accelerator prisma muscles; then make your incision through the skin and fat, very large, beginning on one side of the form in perineum, a little above the place wounded in the old way, and finding a little below the anus, between it and the tuberosity of the ischium; this wound must be carried on deeper between the muscles, until the profate be felt; when, searching for the staff, and fixing it properly, if it has slipped, you must turn the edge of the knife upwards, and cut the whole length of that gland from within outwards, at the same time putting down the rectum with a finger or two of the left hand; by which precautions the gut will always escape wounding; after which, the operation finishes nearly in the same manner as with the greater apparatus.

If, upon introducing the forceps, you do not perceive the stone readily, you must lift up their handle, and feel almost perpendicularly for it; since for the most part, when it is hard to come at, it lies in one of the sinuses sometimes formed on each side of the neck of the bladder, which projects forward in such a manner, that if the stone lie there, the forceps palls beyond it the moment they are through the wound; so that it would be impossible to lay hold of it, or even to feel it, if not aware of this circumstance.

When the stone breaks, it is much safer to take away the fragments with the forceps, than to leave them to be discharged with the urine; and if the pieces are very small, like sand, a scoop is the best instrument; though some prefer the injecting barley-water into the bladder, which suddenly returing, brings away the broken particles of the stone.

As there are hardly any instances of more stones than one, when the stone taken away is rough; so when it is smooth and polished in any part of it, it is almost a certain sign of others behind; on which account, an operator should be careful, in that case, to examine not only with his fingers, but some convenient instrument, for the remaining ones; though indeed, in all cases, it may be proper to examine the bladder after the extraction of the stone; because it is possible there may be a second stone, notwithstanding the first be rough.

The great inconvenience of the lateral operation is the haemorrhage which sometimes ensues in men; for in children the danger of it is not worth mentioning.

If in the operation any very large vessel of the external wound should be divided, it is advisable to tie it before the extraction of the stone; but the necessity of doing this, does not occur once in twenty times.

There is but one objection more of any consequence, which is the danger of wounding the rectum; and this is a very troublesome accident: But if the operator observes the rule laid down with regard to that article, it might always be avoided.

To
In this method the remarkable parts wounded by the knife are, the *musculus transversus penis*, *levator ani*, and *prostate gland*: In the old way, the urethra only is wounded, about two inches on this side the prostate, and the instruments are forced through the rent of the passage, which is composed of the bulbous part of the urethra, the membranous part of the urethra, the neck of the bladder, and prostate gland. This channel is so very narrow, that, till it be torn to pieces, the management of the forceps is exceedingly difficult; and it happens frequently, that from the tender texture of the membranous parts, the forceps are unwarly pushed through it between the *os pubis* and bladder; besides, in introducing the gorget upon the staff, it is apt to slip downwards between the rectum and bladder, both which inconveniences are avoided in the lateral operation. It is true, the wound made in the lateral method will not admit of the extraction of a large stone without laceration as well as in the old way: but in the one case, the laceration is small, and made after a preparation for it by an incision; and in the other, all the parts are torn without any previous opening, and which are so very tight, that the pain of the diffusion must necessarily be excessive. However, in both these operations, the surgeon must not grasp the stone with violence; and even in extracting, must, with both hands to the branches of his forceps, rehit their flatting so tight, as the compression from the lips of such a narrow wound would otherwise make them. The extraction of very large stones is much more impracticable with the greater apparatus than by this method, because of the smallness of the angle of the bones in that part where the wound is made; so that indeed it is necessary in almost all extractions to pull the stone downward towards the rectum, which cannot be done without great violence to the membranous parts, and even the separation of one from another; whence follow abscesses and sloughs about the wound, which is a circumstance not known in the lateral operation. Exsudates followed by suppuration and gangrene, sometimes spread themselves upon the serotum; and in short, all the inconveniences and ill symptoms which attend upon the lateral operation, except the haemorrhage, are in a more violent degree incident to the old way.

An inconvenience of urine is not common after the lateral operation, and a fetula seldom or never the consequence of it.

The manner of treating the patient after the operation, is pretty nearly this: If it happens that the vessels of the prostate bleed, dry lint, or lint dipped in some styptick water, such as *aqua vitiola*, must be applied to the part, and held there with a considerable degree of pressure for a few hours; or a silver canula of three or four inches long, covered with fine rag, may be introduced into the bladder, and left there two or three days, which seldom fails to stop the haemorrhage. The patient may also take an oseate. If the wound does not bleed, a little dry lint, or a pledget of digestive laid gently in it, is best. The place where the patient lies, should be moderately cool, as heat not only disposes the vessels to bleed afresh, but generally makes him low and faint. If, soon after the operation, he complains of a sickness at the stomach, or even a pain in that part of the abdomen near the bladder, it is not always a sign of a dangerous inflammation, but frequently goes off in half an hour: to afflict, however, in its removal, a fomentation put into an hog’s bladder, and applied pretty warm to the part in pain, will be of great service: if the pain increases, after two or three hours, the consequence is much to be feared; and in this case, bleeding, and emollient clysters, by way of fomentation to the bowels, are immediately necessary.

The first good symptom after the operation is the urine coming freely away, as we then know the lips of the bladder and prostate gland are not much inflamed. If the patient should become languid, and continue without any appetite, blisters prove beneficial; which may be applied with great safety, and little pain, as there is seldom or never any haemorrhage. About the third or fourth day a stool must be procured by a clyster; for it seldom comes naturally the first time, and this method must be continued as every man’s discretion shall guide him. As soon as the patient comes to an appetite, he should be indulged in eating light food; with this caution, that he do not eat too much at a time.

If, during the cure, the buttocks should be excoriated by the urine, let them be anointed with nutriment: the dressing from first to last is seldom any other than a soft digestive, or dry lint.

**Of the Stone in the Urethra.**

If a small stone be lodged in the urethra near the glands, it may often be pulled out with the fingers, or picked away with some instrument; but if it stops in any other part of the channel, it may be cut upon without any inconvenience. The best way of doing it, is to pull the prepuse over the glands, as far as you can; and then making an incision the length of the stone, through the teguments, it may be turned out with a little hook or the point of a probe: The wound of the skin slipping back afterwards, to its proper situation, and from the orifice of the urethra, prevents the issue of the urine through that orifice, and very often heals in twenty-four hours. This is a much less painful method of extracting stones from the urethra, than by any instruments that have hitherto been devised.

**Of the extraction of the Stone in Women.**

The extraction of the stone in women, will easily be understood, since the whole operation conforms in placing them in the same manner as men, and, without making any wound, introducing into the bladder a straight director, upon a gorget, and afterwards the forceps to take hold of the stone; all which may be done without difficulty, by reason of the shallowness of the urethra. If the stone proves very large, and in extracting draws the bladder forwards, it is advisable to make an incision through the neck of it, upon the stone; which not only will facilitate the extraction, but also be less dangerous than a laceration which will necessarily follow. The dressings are fomentations and emollient ointments, which should be applied two or three times a day, and the patient in other respects be treated like men who have undergone the operation for the stone.

**Explanation of Fig. 4. Plate CLVII.**

A. A found used in searching for the stone.

The size represented here is but a little too large for the youngest children, and may be used upon boys till they are thirteen or fourteen years of age; a larger should be employed between that age and adulthood, when one of about ten inches, in a right line from the handle to the extremity, is proper. This should be made of steel, and its extremity be round and smooth.
B. A staff fit for the operation on boys from eight to fourteen years of age. The staff for a man must be of the size of the found already described.

C. A staff something too big for the smallest children, but may be used upon boys from about four years of age to eight.

The staff has a groove on its convex side, which first serves as a direction where to cut, and afterwards receiving the beak of the gorget, guides it readily to the bladder. Care should be taken, in making the groove, that the edges of it be smoothed down, so that they cannot wound in passing through the urethra. The extremity should also be open; otherwise it will be sometimes difficult to withdraw the staff, when the gorget is introduced, and presses against the end of it.

These instruments are usually made with a greater bending than here represented, but this shape is more like to that of the urethra, and rather more advantageous for making the incision.

D. The yoke, an instrument to be worn by men with an incontinence of urine. It is made with iron, but for use must be covered with velvet. It moves upon a joint at one end, and is fastened at the other by catches at different distances placed on a spring. It must be accommodated to the size of the penis, and be taken off whenever the patient finds an inclination to make water. This instrument is exceedingly useful, because it always answers the purpose, and seldom galls the part after a few days wearing.

Explanation of Fig. 5. Plate CLVII.

A, A small catheter made of silver. This instrument is hollow, and serves to draw off the urine when under a suppression. It is also used in the high operation to fill the bladder with water. Near its extremity, are two orifices, through which the water passes into its cavity. Care should be taken that the edges of these orifices are quite smooth.

B. The knife used in cutting for the stone: it is the same already described: but it is improper to repeat the figure with the alteration of a quantity of tow twilled round it, which makes it easier to hold, when we perform the lateral operation, and turn the edge upwards to wound the prostate gland.

C. A female catheter, differing from the male catheter, in being almost straight; and something larger.

D. A silver-wire to pass into either catheter, for the removing any grumous blood or matter that clogs them up.

Explanation of Fig. 6. Plate CLVII.

A. The gorget used upon men in the lateral operation.

B. The gorget used upon children under five years of age in the lateral operation.

A gorget between the sizes of these two will be fit for boys from five years of age to fifteen or sixteen.

These instruments are hollow for the passage of the forceps into the bladder; and their handles lie flattening, that they may the more readily be carried through the wound of the prostate, which is made obliquely on the left side of it. The beak at the extremity of the gorget must be smaller than the groove of the staff which is cut upon, because it is to be received in the groove. Care should be taken, that the edges of the gorget near the beak are not sharp, leaf-like, instead of dilating the wound, as it ought, it should only cut on each side when introduced; in which case, it would be difficult to carry the forceps into the bladder.

C. A gorget, with its handle exactly in the middle; this shaped instrument is used in the old way. All the gorgets should be made of steel.

Explanation of Fig. 7. Plate CLVII.

A. The forceps for extracting the stone. These are represented a little open, that the teeth may be better seen within side.

This instrument must be of different sizes for different ages and stones, from the length of four inches to one of near a foot long; but the forceps of about eight inches long will be found most generally useful. The number necessary to be furnished with, will be four or five.

Great care should be taken by the makers of this instrument, that it move easily upon the rivet; that the extremity of the chops do not meet when they are shut; and particularly that the teeth be not too large, lest, in entering deep into the stone, they should break it. It is of consequence also that the teeth do not reach farther towards the joint than here represented, because a small stone, when received into that part, being held fast there, would dilate the forceps excessively, and make the extraction difficult; on which account, the inside of the blades near the joint should be smooth, that the stone may slip towards the teeth.

B. A director made of steel, used for the direction of the gorget, in the extraction of the stone from women.

C. A scoop to take away the stone when it is broken into small pieces like sand. This instrument is made of steel.

Of the Empyema.

The operation for the empyema generally implies an artificial opening made into the cavity of the thorax, by which we evacuate any fluid that lies there extravasated, and is become dangerous by its weight and quantity. The fluids described as necessary to be voided by this operation, are blood, matter, and water.

When blood is the fluid, supposed to require evacuation by this method, it is always extravasated through some wound of the vessels of the lungs or thorax, and being discharged in great quantities on the diaphragm, is said to oppress respiration, till let out by some convenient opening made in the most depending part of that cavity, which is the only kind of perforation into the thorax distinguished by the name of the operation for the empyema. But though this opening is universally recommended in the case here stated, yet we meet with few or no examples where it has been practiced for a mere extravasation of blood.

To empty the thorax, in a rupture of any vessels which open into it, bleeding is very necessary; which not only stops the hemorrhage, by abating the force of the circulation; but likewise, by unloading the vessels of their contents, makes them more fit to receive the extravasated fluid by absorption: gentle evacuations and hopes are also very serviceable, and a low diet is absolutely necessary.

The second circumstance in which this operation takes place, is a rupture of matter from the pleura mediastinum or lungs into the cavity of the thorax, where accumulating it at length proves fatal for want of a discharge. It is true, that the case occurs but very seldom, where the operation is necessary; because, in most abscesses of the thorax, the matter
mater is usually spit up as fast as it is generated; and in the
diffusion of such who have died of this species of consum-
tion, we rarely find much extravasated pus in the cavity,
though a great portion of the lungs be destroyed. However,
there are a few examples which require the operation: and
these may be distinguished by the following symptoms. The
patient is obliged to lie upon the diseased side, or, in cafe
there is matter in both cavities of the thorax, on his back;
because the mediastinum can seldom support the weight of
the incumbent fluid, without suffering great pain; but this
rule is not certain, it sometimes happens that the patient
can lie with ease on that side where there is no fluid. An-
other symptom of extravasated matter, is an evident un-
dulation of it, so that in certain motions it may be heard to
quaff. For the most part too, upon careful inquiry, an
edema, or at leat a thickening of some portion of the inter-
costal muscles, will be discovered, And lastly, if there be
much fluid, it will be attended with a preternatural expan-
sion of that side of the chest where it lies. When there-
fore these signs appear after a previous pleuritic or pulmona-
ry disorder, and the cave has been attended with the symp-
toms of a suppuration, it is most probably owing to a col-
cction of matter; though the patient will also labour under
a continual low fever, and a particular anxiety from the load
of fluid.

The left part of fluid faild to require issue from this opera-
tion is water, which however very seldom collects in such
manner as to become the proper subject of the operation:
for if the drophy of the thorax be complicated with an ana-
farca, or even afeptis, it is certainly improper; and indeed it
hardly ever takes place, but where the diftemper is single,
and takes its rise from the fame fides of disorders in the lymph-
atics of the pleura, as the hydrocele does from thofe of the
tunica vaginalis. The symptoms of this drophy are, a small
cough without fpritting, a little low fever from the diftur-
bance of respiration; fometimes too the water, by a fudden
jerk, may be heard to quaff; and, generally speaking, its weight
upon the diaphragm and mediastinum are fo troublesome as
to oblige the patient to ftoop forward, and to turn upon the
affected side when he lies down; for the fame reafon, when
there is water in both cavities of the thorax, he is forced to
lie on his back.

The manner of operating, whether it be for the discharge
of matter or water, is to pitch upon the moft depending part
of the thorax, which fame have fuppofed to be between the
eighth and ninthrib, and others between the ninth and tenth,
as the diftance from the vertebra that the depth of the
fein may not be an impediment to the perforation. This
difiance is determined to be about a hand's breadth: and here,
with a knife, fciilars, or trocar, we are ordered to make the
perforation; but in doing it there are a great many dif-
iculties. In fat perfons, it is not easy to count the ribs, and
the wound will be very deep, and troublesome to make; it
is hardly possible to escape wounding the intercostal artery,
which runs in this place between the ribs. But if the only
advantage proposèd by the situation of the wound be de-
rived from its dependency, the operation of discharging the
fluid will be as well anfwered by an opening between the
fifth and seventh rib, half way from the sternum towards
the spine; which, by laying ourselves down, becomes in effect
as depending an orifice, as the other in fitting up: and by an
opening made in this manner we avoid all the inconveni-
cies in the other method: For in this part of the thorax
there is very little depth of mueles; the artery lies conceal-
ed under the rib; and the diaphragm is at great distance.
The opening is beft made with a knife, and should be about
an inch long through the skin, and half an inch through the
subfacent muscles; though, to make the incifion with the risk
of wounded the lungs, it may be advisable to dilate it with
the blunt-pointed knife (as is practifed in the operation for
the bubonoccele) after having made a small puncture with a
common knife. The treatment of the wound will be accord-
ing to the nature of the difcharge. If, after a few days, there
appears no drain, you may let the orifice heal up; but if it
continues, it may be kept open with a fhort fifer canal,
until fuch time as an alteration in that circumftance will give
us leave to cicatrize with safety.

Of Encyftled Tumours.

These tumours borrow their names from a cyft or bag,
in which they are contained; and are farther dillinguifhed
by the nature of their contents: If the matter forming them
resembles milk-curds, the tumour is called atheroma; if it
be like honey, meliceris; and if composed of fat, or a
fucy fubfance, featoma. The two firft are not readily dif-
tinguifhed from one another, but their difference from the
featoma is eafily learnt by their softnefs and fuddnation.
Thfe tumours appear in every part of the body, and in pla-
ces where there are no glands.

The featoma is never painful untl by its weight it grows
troublefome, nor is it a mark of general indifpofition of body;
so that the extirpation feldoms fails of succefs. The fize of
fome of them is very large, frequently weighing five or fix
pounds, and there have been infances of their weighing above
fory.

When the featoma is irregular in its furface, with emi-
cencies and defpreffions, it is fucy; whereas the fat one has
for the moft part a uniform smooth outside. The operation
for the featoma will be underftood by the defcription of
that for the fchirrhus.

The atheroma is much more common than the meliceris;
at leat, if all encyfted tumours with matter not curdled, may,
in compliance with cuftom, be called fo: These are more
frequent, and grow larger than thofe where the matter is
curred, being often attendant on fcorphulous indifpofitions,
which makes them more difficult of cure.

The cyfts of these tumours, with the skin covering them,
after a certain period of growth, reftifting any further enlarge-
ment, do frequently inflame and break; but this opening is not
fo advantageous for the cure as extirpation by the knife, which
fhould be done in the infancy of the swelling. When the
tumours are no bigger than a small golden pippen, they may
be diffected away from under the skin, by making a ftraight
incifion only through it; but if they exceed this bulk, an
oval piece of skin must be cut through first, to make room
for the management of the knife and taking away the tumour;
in which cafe, it will be advifable to take off the upper por-
tion of the cyft with the skin; and then, by the help of a
hook, to diffect away as much of the remainder of it as can
be conveniently, which is a lefs painful and more feure me-
thod than deftroying it afterwards with efcharoticks. This
rule is to be obferved, when the cyft runs fo deep amongst
the interfices of the mufeles, as to make it impoffible to re-
move the whole of it, where, if we cut off a great quantity,
the refiually comes away in floughs and matter.

The ganglion of the tendon is an encyfted tumour of the

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melliferous kind, but its fluid is generally like the white of an egg; when it is small, it sometimes disperses of itself; pre-
spire and sudden blows do also remove it; but for the most part it continues, unless it be extirpated. It is no uncom-
mon case to meet with this species of ganglion, running un-
der the ligamentum carpeale, and extending itself both up
the wrist and down to the palm of the hand. The cure of this
disorder cannot be effected but by an incision through its
whole length and dividing the ligamentum carpeale.

The dressing in these cases does not at all differ from the
general methods of treating wounds.

Of the Amputation of the Cancered and Scirrhous
Breast.

The success of this operation is exceedingly precarious,
from the great disposition there is in the constitution, after
an amputation, to form a new cancer in the wound, or some
other part of the body. When a scirrhous has admitted
of a long delay before the operation, the patient seems to
have a better prospect of cure without danger of a relapse,
than when it has increased very fast, and with acute pain.

The scirrhous may be distinguished, by its want of in-
flammation in the skin, its smoothness and slipperysets deep
in the breast, and generally by its prickling pain, which as
it is more or less, increases the danger accordingly; though
there are some few with little or none in the beginning: as
the tumour degenerates into a cancer, which is the worst
degree of scirrhous, it becomes unequal and livid, and the
vessels growing varicous, at last ulcerate.

In extirpating the scirrhus, if it be small, a longitudinal
incision will dilate sufficiently for the operation; but if
too large to be dissected out in that manner, an oval piece
of skin must be cut through first, the size of which is to be
proportioned to that of the tumour; for example, if the
dwelling is five inches long, and three broad, the oval piece
of skin cut away must be nearly of the same length, and
about an inch and a half in breadth. In taking off the
whole breadth, the skin may be very much preferred, by
making the wound of it a great deal less than the bulk of
the breast, which must be carefully cleared away from the
pectoral muscles. This is not difficult to do because all these
scirrhoues being enlarged glands, are encompassed with their
proper membranes, which make them quite distinct from
the neighbouring parts, and easily separable; at least this
is the case when the tumour is movable; for sometimes it adheres to the subjacent muscle, and that muscle to the
ribs; in which circumstance, the operation is impracticable.

When it is attended with knots in the arm pit, no service
of this part, without a fracture, will also occasion the same
factors: For this reason, the operation may take place
where the scull is not much offended, but only the vessels of
the dura mater, the pia mater, or the brain.

When the cranium is beaten inward, without any frac-
ture, it is called a depression; when very much broken, a
fracture; or if broken and beat in also, a fracture with de-
pression; if it is only cracked without depression, though
properly a fracture, it is called a fissure; if none of these
disorders appear, where there is a suspicion of them, the
symptoms are imputed to a concussion of the brain. These
are the four dispositions in use, and which fully comprehend
all the others.

The depression of the cranium without a fracture can
but seldom occur, and then it happens to children whose
bones are more pliable and soft than those of adults.

In blows of the cranium, requiring the use of the tre-
pan, the marks of a fracture are generally very evident,
since the scalp is often lacerated so much, as to expose it to
outburst. But if the wound of the scalp be so small, as only
to admit a probe, we must judge then by the feel of the
surface of the bone, using the caution of not mistaking a fa-
ture for a fracture.

If there be no wound of the scalp, you must press about
the
the head with your fingers, till the patient complains of some particular part, where in all likelihood the place affected, and, if the scalp there be separated from the cranium, is almost inallibility so. The symptoms of a fracture, are, a bleeding at the ears and nose, a lot of sepsis, vomitings, drowns, delirium, incontinence of urine and excrement; but what is most to be depended upon, is a depression of the bone, or a roughness on its surface; for all the other complaints not only happen to concussions, which do well without the application of a trepan, but likewise there are fractures not attended with any of them, or at least in a slight degree; so that these symptoms alone, without examination of the part affected, are but an uncertain rule to go by.

In concussions without a fracture, that produce the symptoms here laid down, and do well afterwards, the vessels of the brain and membranes are only inflamed and dilated; or if they are ruptured, they absorb the extravasated blood again; on which account, nature should be assisted by plentiful bleedings, clysters, and other evacuations, and so in all fractures where the patient is not trepanned immediately: however, although people with violent concussions do sometimes recover, it is so very seldom, that there can be no pretence, when they happen, for neglecting the trepan, but not being able to learn in what part the concussion is.

Writers dispute very much about the possibility of the centra fissure, or a fissure occasioned on the part of the head opposite to that on which the blow is given, or where the inner table is fractured while the outer one remains entire; but there are histories of cafes, which, if fairly stated, make it unquestionable; and this is most certain, that if the complaint be at a distance from where the blow was received, there can be no danger in scalping, and applying the trepan to that part where the pain is.

When we are affured of a fracture or depression, it is always advisable to trepan as soon as possible, in order to prevent the spreading of the abscesses, which seldom fails to follow upon the rupture of the vessels of the brain and membranes, and for the most part in a few days.

The manner of treating a fracture of the cranium, will be according to the nature of the fracture itself, and the injury of the scalp. If the wound of the head be torn into angles, perhaps cutting off the lacerated flaps will make room for the saw; if the bone be broken into several pieces, the pieces may be taken away with the forceps; or if some of the skull be also depressed, the removal of the pieces will, without perforating, make way for the elevator to raise the depressed part; but if the fracture be not complicated with a wound of the scalp, or the wound be too small to admit of the operation, which seldom fails to be the case, then the fracture must be laid bare, by taking away a large piece of the scalp.

Before the application of the trepan, it is to be remembered there are certain places on the skull where it cannot be used with so much safety as on others; the whole length of the sagittal fissure, down to the nose, is always mentioned as one where the perforation is dangerous, because of the spine of the os frontis, and the course of the superior longitudinal fissus under this part, which it is supposed would be necessarily wounded by the saw, and in consequence destroy the patient by the hemorrhage: but though a perforation may, contrary to the general opinion, be made over the fissus without offending it, and, even if it was wounded, the effusion of blood would not in all probability be mortal; yet at best it would be very troublesome; and since we are not frightened in that part of the cranium for room, it is advisable to forbear operating in this place. The bone fissus of the os frontis forbid the use of the trepan near the orbits of the eyes; therefore, if it should be depressed near those cavities, the surgeon must be careful to perforate either above, or on one side of the fracture; for sawing below it will only lead into the sinus, and answer no purpose in the design either of giving a discharge to the matter from the brain, or an opportunity to elevate the depression; nay, perhaps leave an incurable fistula, if the patient escapes with life.

The os occipitis being very uneven, both in its internal and external surface, makes trepanning there almost impracticable; besides, the great fissures run about so much of it, as hardly to afford space to perforate without danger of wounding them; but then it is so defended from injuries by its situation and strength, that fractures do not happen to it so often as to the other bones of the cranium; and when they do, for the most part they become so soon mortal, by affecting the cerebellum which it sustains, that the operation is seldom required in this case. Indeed the upper angle of this bone lies above the cerebellum, and, when fractured or depressed, is not attended with so immediate danger; but when this happens, the course of the longitudinal fissus down the middle of it, and the neighbourhood of the lateral fissures beneath it, make it advisable to trepan at the lower part of the os parietale, or at least upon or just below the lambdoidal future, so that the perforation of the os occipitis can hardly ever be proper.

Though wounds in the cerebellum are always mortal, yet great portions of the cerebrum have been carried off, or depressed, without any notable inconvenience. The places then unfit to admit the saw, are the three described; that is, the sagittal fissure; that part of the os frontis near the orbits of the eyes; and the os occipitis. But when a fracture happens in any other part above the ear, there is no objection to the operation. When there is only a small fissure without any depression or motion in the bone, the trepan may be applied on the fissure itself, which will more readily give vent to the blood or matter underneath, than if made at a distance. If the fissure be large, and the bone weakened or depressed, the trepan must be applied on one side of it, but so as to make it a part of the circumference of the sawed piece; if the fracture run upwards, it will be eligible always to perforate near its bottom, because the dependency of the orifice will give better issue to the matter, though the ill-grounded apprehension of the brain falling out there has made many eminent surgeons contradict this rule in their practice. If, by making one orifice, you cannot raise all the depressed part, you must make a second and a third, and continue doing so, till you have reduced the whole cranium even; there is frequently occasion to repeat it twice or thrice; and it has been done twelve times, nay oftener, with success; which shews the little danger there is, either in sawing the skull, or exposing the dura mater and brain, when the pressure is taken off. Indeed the mischief of laying the brain bare is so small, compared with a concussion of it, or an abscess from pent-up matter, that those fractures of the skull, where the bone is broken into splinters the whole extent of it, and can be taken away, much more readily do well, than a simple fissure only, where the abscess cannot discharge itself freely; for which
which reason, though the depressed fracture may be raised by the means of one orifice, yet, if it is of a considerable length, it will be almost absolutely necessary to make one or two more openings, for the convenience of dischage; since, for want of this, we see abscesses increase daily in their quantity of matter, and at the end of a few weeks carry off the patient.

In concussions of the brain without a fracture of the cranium, if the trepan be applied, and vast discharges ensue, it will be also convenient to make more perforations into the abscess and the neighbourhood of the abscess, the situation of which will be easily guessed by the direction of the stream of matter. And here it is to be observed, that abscesses, which ensue from a concussion are generally more extensive and dangerous than those which accompany a fracture with depresion: for in a fracture, the yielding of the bone destroys, in a great degree, the force of the striking body, and prevents any violent commotion of the brain; so that what the brain suffers results chiefly from the pressure of the incumbent bone, and the laceration of the vessels, near the fracture: whereas, when the cranium refists the shock, all, or great part of the cerebrum suffers the concussion, and is often impollumated or inflamed almost in its whole dimension.

The manner of trepanning is this: Having fixed your patient's head steady, either on the bolster of a bed, or by placing him in a low chair; with the pin of your faw, mark the center of the piece of bone to be taken out; then with the perforating trepan, make an orifice deep enough to receive the pin, which being fixed in it, will prevent the faw from flipping; and thus you are to continue sawing, till the imprefion made will preserve the steadiness within it: the pin, when it is to be taken away, for fear of its wounds the brain before the faw has entered through the cranium, which it would do at last, because of its projection. In working through the bone, the teeth of the faw will begin to clog, by that time you arrive to the diplone; wherefore a brush must be ready to clean it every now and then; and with a pointed probe you must clear away the dust in the circle of the trepanned bone, observing if it be deeper on one side than the other, to lean afterwards on that side where the impreffion is leaft, that the whole thickness may be sawed through at the same time. To do all this with less interruption, it will be proper to have two faws of exactly the fame diameter, that an attendant may be brushing one while you operate with the other. We are advised to saw boldly till we come to the diplone, which, it is said, will always distinguish itself by the bloodstains. But, however, this is not a certain mark to go by: for though, where there is a diplone, it will manifest itself by its bloodstains, yet sometimes the faw is so very thin as not to admit of any; in which case, if an operator should push on his instrument in expectation of meeting with this subflance, he would unwarily wound the brain. This is not very often the case; but, however, often enough to put a man on his guard, and make him inquire whether the bone be loose after a little sawing, which is the only rule we go by when we have paffed through the diplone, and may as well be attended to before coming at it, without any considerable loss of time. When it is quite sawed through, and lies loose, it may be taken away with the forces contrived for that use; and if the lower edges of the orifice, next to the dura mater, are splintered, they may be scraped smooth with a lenticular.

These are the chief processes of the operation of the trepan. The only thing remaining to be done, is, with an elevator introduced at the orifice, to raise the depresion, or broken splinters, if they cannot otherwise be laid hold of, and to draw out the grumous blood, or any other extraneous body. If the dura mater be not wounded or torn, an incision must be made through it, to give way to the blood or matter, which almost certainly lie underneath it, if the symptoms have been bad, and done has been discharged from between the cranium and dura mater: Though it has been lately observed that an abscess will sometimes be formed in the substance of the brain; and therefore, if the puncture of the dura mater does not procure an evacuation of the matter, and the symptoms of a suppuration are still urgent, it will be advisable to make a small incision with a lancet into the brain itself.

We have used the word trepan all along, for the sake of being better understood; but the instrument here recommended is a trephine; the advantages of which, as also that of a cylindrical faw, or one nearly cylindrical, are described in the explanation of the copper-plate.

With regard to the dressings of these wounds, it is very certain, that as the greatest part of the evil proceeds from the quantity and pressure of the matter, whatever approaches towards the nature of a tent, and increases its quantity and pressure by locking it up, must be pernicious. Therefore the use of all lyndows whatever should be excluded. The best application, too, of spirits of wine, which is so commonly advised, cannot be proper, as they are not only unfit for inflammations in general, but also clog up the vesicles of the dura mater and brain, and stopping the suppuration, sometimes produce a gangrene. Since then a close application is inconvenient, and, whatever good there may be in topical medicines, it cannot for the most part be communicated to the abscesses, by reason of its extent beyond the orifice, the best remedy will be dry lint only, which must be laid on hourly to give vent to the matter, and be repeated twice a day till the discharge is lessened, when once in twenty-four hours will be sufficient to the diminishing of the cure, which will be something retarded by the exfoliations that sometimes follow this operation. The patient afterwards may wear a plate of tin upon the ear, to defend it from blows or any accidental injury.

Explanation of Fig. 1. Plate CLVIII.

A. The perforator, commonly called the perforating trepan. With this instrument, an orifice is usually made for the reception of the pin, on the centre of the piece of bone that is to be taken away, in the operation of trepanning; though if the pin be very sharp, and project but little beyond the teeth of the faw, as in that marked with the letter B, the perforator would be needless; but as the point of the pin presently grows blunt with use, and, in that case, it is difficult to fix the pin, it is advisable to have this instrument in readiness. It is also handy for boring into the substance of the bone, in order to promote a granulation of flesh on their surfaces. When it is made use of, it must be received and fastened in the handle C.

B. The crown, or faw of the trepan, with the pin appearing just beyond the extremities of the teeth. The shape of this faw is cylindrical.

C. The handle of the foregoing instrument, called the trephine; which is much preferable to the trepan, (an instrument like a wimble used by joiners,) because of the great
great convenience of holding it, and leaning on one side or other of the saw, as we find it necessary. The tenon however, though allowed to be unhandy, is the instrument most used by surgeons in other parts of Europe, upon the supposition of its working quicker than the trephine.

The trephine here represented is of such a shape as to make it a convenient elevator, for which purpose the extremities of it are made rough.

D, A key to take out the pin E, when the saw has made an impression deep enough to be worked without the help of it.

**Explanation of Fig. 2. Plate CLVIII.**

A, A convenient forceps to take out the circular piece of bone, when it does not stick to the saw: the contrivance by which they readily lay hold of it, is to make the extremities that are to grasp it, with an arch of the same circle as the saw is made. Upon one of the handles, there is added a little elevator, to lift up any small splinter of bone.

B, A lenticular: the fore-part of its blade is sharp, in order to scrape the lower edge of the orifice of the cranium, in case any splinters should remain after the operation; and the button at its extremity receives the durt, that it may not fall on the brain; but there is seldom any occasion for this instrument.

C, A rudge or raspatories, for scraping bones in order to promote granulations of flesh. The handles of these two last instruments are wood, whereas every part of the others should be made of steel.

**Of the Cataract.**

The cataract, called by the Latins suffitfo, is a disease of the crystalline humour, rendering the whole body of it opaque, so that the rays of light, which, in the natural state of its transparency, were transmitted to the tunica retina, become now totally intercepted, and produce no effect. This is pretty nearly the account delivered down to us by Hippocrates and the ancient Greeks, who likewise knew it by the name of glaucoma.

Anatomists have frequently disputed the eyes of persons under this disorder after their death, and have found it to be always an opacity of the crystalline humour, agreeably to the definition of a glaucoma: so that by consequence we must understand the words cataract and glaucoma as synonymous terms.

The general criterion of the fitness of cataracts for the operation, is taken from their colour; the pearl coloured, and those of the colour of burned iron, are esteemed proper to endure the needle; the white are suppos’d milky, the green and yellow horne and incurable.

The depression of a cataract of any colour would be the cure, if that alone was the dilater of the eye: but it generally happens, that the yellow cataracts adhere to the iris so firmly as to become immovable; besides, when they follow in consequence of a blow, which is often the case, either the cells of the vitreous humour are so much disturbed and broken, or the retina affected, that a degree of blindness will remain, though the cataract be depressed.

To judge whether the cataract adheres to the iris, if you cannot at once distinguish it by your sight, flit that of the patient’s eye, and rub the lids a little: then suddenly opening it, you will perceive the pupil contract, if the crystalline humour does not prevent the action by its adhesion: And when this is the case in any kind of cataract, the operation can hardly be advised.

Another consideration of the greatest moment, before undertaking the cure, is to be an advising of the right flare of the tunica retina: which is very readily learnt, where there is no adhesion of the cataract, from the light falling between the iris and crystalline humour, which if the eye is not sensible of, it is a certain indication of another malady, and absolutely forbids the operation. Generally, this cataract takes its rise from head-aches, convulsions, and nervous disorders.

When none of these objections forbid the operation, it may be thus done: Having placed your patient in a convenient light, and in a chair suitable to the height of that you yourself sit in, let a pillow or two be placed behind his back. In such a manner, that the body bending forward, the head may approach near to you; then inclining the head a little back, upon the breast of your assistant, and covering the other eye so as to prevent its rolling, let the assistant lift up the superior eye-lid, and yourself depress a little the inferior one. This done, strike the needle through the tunica conjunctiva, something less than one tenth of an inch from the cornea, even with the middle of the pupil, into the posterior chamber, and gently endeavour to depress the cataract with the flat surface of it. If, after it is dislodged, it rises again, though not with much elasticity, it must again and again be pushed down. If it is membranous; after the discharge of the fluid, the pellicle must be more broke and depressed: if it is uniformly fluid, or exceedingly elastic, we must not continue to endanger a terrible inflammation, by a vain attempt to succeed. If a cataract of the right eye is to be couched, and the surgeon cannot use his left hand so dexterously as his right, he may place himself behind the patient, and use his right hand.

We have not recommended the speculum oculi, because, upon the discharge of the aqueous humour through the puncture, the eye, being somewhat emptied, more readily admits of the depression of the crystalline humour, than when depressed upon by the instrument.

As to the method of treating the succeeding inflammation, bleeding and other gentle evacuations are found absolutely necessary.

**Of Cutting the Iris.**

There are two cases where this operation may be of some service; one when the cataract is from its adhesion immovable; and the other, when the pupil of the eye is totally closed up by a disorder of the muscular fibres of the iris, which gradually contracting the orifice, at last leaves the membrane quite imperforate. This last disordered has hitherto been deemed incurable. The adhesion of the cataract has been considered as a species of blindness not to be relieved: but Mr Cheffelden has invented a method of making an artificial pupil, by slititng the iris, which may relieve in both the instances here stated.

In doing this operation, the patient must be placed as for cousing, and the eye kept open and fixed by the speculum oculi, which is absolutely necessary here; then introducing the knife in the same part of the conjunctiva you wound in cousing, insinuate it with its blade held horizontally, and the back of it towards you, between the ligamentum ciliare and circumference of the iris, into the anterior chamber of the eye; and after it is advanced to the farther side of it,
make your incision quite through the membrane; and if the operation succeeds, it will upon wounding fly open, and appear a large orifice, though not so wide as it becomes afterwards.

The place to be opened in the iris, will be according to the nature of the disease: if the membrane itself be only affected with a contraction, the middle part of it; which is the natural situation of the pupil, must be cut; but if there be a cataract, the incision must be made above or below the cataract, though it is more eligible to do it above.

The contracted iris, from a paralytic disorder, is so often complicated with an affection of the retina, that the success is very precarious in this case. This operation has answered well in adhesions of the crystalline humour, though not so often as might be expected; for this success is very precarious in this case. This operation has answered well in adhesions of the crystalline humour, though not so often as might be expected; but even there.

**Explanation of Fig. 3. Plate CLVIII.**

A. The couching needle, the broad part of which towards the point is flat on one side; but on the other is a little convex to give it more substance and strength.

The handle of this instrument is white-ivory, inlaid with a streak of black in that part of it lying even with the convex surface of the blade: The meaning of which is, that by holding the handle with the stroke upwards, we may possibly guide to depress the membrane of a milky cataract with the flat surface, though the substance of the cataract swimming in the eye obscures the needle, and prevents its being directed in a proper position by the light.

B. A speculum oculi, which is made to open or shut by an iron button sliding along a slit in the handle. This instrument is composed of one piece of steel, in such a manner that it would fly open by its elasticity, if the two branches of the handle were not confined by the button. The circle of it should be covered with velvet, to make it lie softer on the eye-lids.

C. The knife for cutting the iris, the blade of which has two edges, resembling a lancet, which are more advantageous than one only, in cutting the cornea for the extraction of the cataract.

**Of the Fistula Lachrymalis.**

The fistula lachrymalis is generally understood to be such a disorder of the canals leading from the eye to the nose, as obstructs the natural progress of the tears, and makes them trickle down the cheek: but this is only the first and mildest stage of the disease. In the next, there is a mucus resembling matter, and afterwards matter itself discharged with the tears from the puncta lachrymalia, and sometimes from an orifice broken through the skin between the nose and angle of the eye. The last and worst degree of it is, when the matter of the abscesses, by its long continuance, has not only corroded the neighbouring soft parts, but also affected the subjacent bone.

Monseur Annell, a French surgeon, recommends in the recent fistula, to pass a small probe through one of the puncta lachrymalia into the fascus and nose, in order to break the concretions which were supposed to make the obstruction, and with a small pipe and syringe to throw an injection through the other, in order to wash them away.

The manner of operating in those cases where perforation is not required, is this: Supposing the abscesses not broken, chafe a time when it is most turgid with matter; and to his end, you may shut the patient's eye the day before, and lay little slips of plaster upon one another across the lids, from about the puncta lachrymalia to the internal angle; which compressing their channels, and preventing the flux of the matter that way, will heap it up in the bag, and indicate more certainly the place to be cut. If the abscess is already open, the orifice and probe will inform you where to enlarge: then placing the patient in a seat of convenient height for the management of your hand; with a small incision-knife dilate from the upper part of the bag, down to the edge of the orbit, without any regard to the tendon of the orbicularis muscle, or fear of wounding the blood-vessels; though if you see the vessels, it is proper to shun them. The length of this incision, will be near four tenths of an inch. It has been advised, in opening the bag, to introduce a small probe through one of the puncta into its cavity, to prevent wounding the posterior part of it. But this excess of care may be more troublesome than useful; since, in far large a vessel, a very small share of dexterity is sufficient to avoid the mistake. In making this incision, care must be had, not to cut too near the junction of the eye-lids, because of the deformity of the succeeding scar; though the clearer eye or even, contraction of the skin in that part, after the operation, is generally owing to the use of the cautery, and not to the wound of the tendon of the orbicularis muscle; for this last is necessarily from its situation always cut through, but without any inconvenience, because of the firm cicatrix afterwards that fixes it strongly to the bone.

When the bag is open, it is to be filled with dry lint, which the next day may be removed, and exchanged for a dose of a hot diast in a hot digestible medicine; this must be repeated every day once or twice, according to the quantity of the discharge; now and then, when the matter is not good, using the precipitate medicine, and from time to time a sponge-tent, to prevent the too sudden reunion of the upper part of the abscesses. When the discharge begins to lessen, it will be proper to pass a small probe, a small bougie, or silver wire, through the nasal duct into the nose, every time it is drest, in order to dilate it a little, and make way for the tears and matter which by their drain will continue to keep it open. This method must be followed till the discharge is nearly over; and then dressing superficially with dry lint, or any drying application, the wound will feel safe and healing. After the care, in order to prevent a relapse, it will be proper, for a few weeks, to wear the compressing instrument represented in the copperplate.

When the bone is bare, and the fistula requires perforation, the perforator is not to be carried down the ductus ad nasum, for fear of boring into the sinus maxillaris; but more internally towards the nose, which will bleed freely, it properly wounded. The wound afterwards should be dressed with Joshils, in the manner above described, and the probe or silver wire be every day passed through the ductus ad nasum. Left, after the cure of the abscesses, it should still remain obstructed; and if, upon trial, the duct should be so filled up as not to admit the wire, it will be right to keep open the perforation into the nose with a small tent, till the discharge is almost quite ceased.

**Explanation of Fig. 4. Plate CLVIII.**

A. The eye, with the skin of the eye-lids denuded, in order to show the orbicularis muscle: the white streak running from the inner angle of the eye toward the nose is the tendo a.
tendon of the orbicularis muscle. At a little distance from
the internal angle, on the edge of the eyelids may be
observed two black spots, which are the orifices of the
lacrimal channels, and called the puncta lachrymalia.

B. The exact dimension of the lacrymal channels and
bag; the pricked line represents the edge of the orbit.

C. A small incision-knife, more handy than a larger for
opening the bag.

D. The perforator to destroy the os unguis, if ever it
should happen to be necessary.

E. An iron instrument made thin and pliable, to set even
on the forehead, and for use covered with velvet: the holes
at the three extremities receive two pieces of ribband, by
which it is fastened on the forehead: the button at the end
of the screw is to be placed on the fascus lachrymalis, and
the screw to be twisted till the button makes a considerable
preasure on the bag: the button should be covered with vel-
et, and a little compresa of plaster be laid on the bag be-
fore it is applied, to prevent the skin from being galled by
the preasure. The little branch of iron which receives the
screw must be soft enough to admit of bending, otherwise
it will be difficult to place the button exactly on the bag.
This instrument is for the left eye only; it should be worn
night and day in the beginning of a hiltula, and after a hiltula
has been healed by incision; but as the succusses depends upon
the exact situation of the button upon the bag, it should be
carefully looked after.

Of Bronchotomy.

The operation of bronchotomy is an incision made in the
aerina artesia, to make way for the air into the lungs,
when respiration is obstructed by any tumour comprizing the
larynx, or some other disorder of the glottis and aorpa
arteria, without any apparent tumour.

The manner of doing it is, by making a longitudinal in-
cision through the skin, three quarters of an inch long, op-
posite to the third and fourth ring of the trachea, if you
have the choice of the place; and when you cannot make
it so high, the rule will be to wound a little below the
tumour; it is always advised to pinch up the skin for this
proceed, which however may be left to the discretion of the
surgeon. When the skin is cut through, you must make a
small transverse incision into the wind-pipe, and immediately
introduce a silver crooked canula near half an inch long,
with a couple of little rings at the top of it, through which
a ribband may be passed round the neck, to keep it fixed in
the wound.

The method of dressing will be easily understood; since,
after the patient can breathe by the natural passage, if you
withdraw the hollow tent, the wound will become a simple
one, and, notwithstanding its penetration through a carri-
lage into a large cavity, require a superficial application
only.

Of the Extirpation of the Tonsils.

These glands sometimes grow so large and ferruous as
to become incurable, and even to threaten suffocation if not
extirpated. The manner of doing this operation formerly,
was by cutting them off: but the almost constant consequence
of this wound was a violent bleeding, and sometimes too
a mortal one; on which account it is rejected in favour of
the ligature, which is not only void of danger, but also sel-
dom fails of cure.

If the basis of the tonsil is smaller than the upper part,
you may pass the ligature by tying it to the end of a probe,
bent into the form of an arch, and set into a handle; which
being carried beyond the gland, and round it, is to be
brought back again: this done, you may easily tie it by the
means of an instrument of Mr. Chefelden's contrivance, which
holds one end of the string on the side of the tonsil next the
throat, while you make the knot by pulling the other with
the right hand quite out of the mouth, as will be easily un-
derstood by the draught in the copper-plate. Should it
happen that the tonsils are conical, so that the ligature will
necessarily slip over its extremity when we attempt to tie;
in this case, he has recommended an instrument like a crook-
ed needle, set in a handle, with an eye near the point,
threaded with a ligature, which is to be thrust through the
bottom of the gland, and being laid hold of with a hook,
the instrument is to be withdrawn; then pulling the double
ligature forwards, it must be divided, and one part be tied
above, and the other below the tumour: the knots are to
be always double, and the ligature to be cut off pretty near
them.

If after four or five days they slip, or seem to have mort-
tised the tonsil only in part, you must repeat the whole
operation; and if it fail a second time, you must even repeat
it again.

This kind of extirpation is more practised in large piles,
that are esteemed incurable. When the piles are within the
intestines, you must place your patient over a fomenta-
tion in a clofetooj, and have a crooked needle with a
double ligature ready to pass through them, when by drain-
ing they are pulled out of the anus (for sometimes the in-
testine will return suddenly,) and tie above and below as in
the instance of the tonsil. Sometimes the piles are of that
shape as to admit a single ligature to be tied round them
without the help of a needle, which is less painful. If there
are several, you must only tie one or two at a time; for the
pain of the ligature is excessive, and would be intolerable
if many were tied at once: however, every five or six days,
the operation may be repeated till all are extirpated, and
the parts must be kept supple by some emollient ointments.

When the piles are small, they may safely and with much
less pain be cut off.

The uvula is subject to so great a degree of relaxation
sometimes, that it almost chokes the patient: the readieli
cure is cutting off all but half an inch of it, which may be
done at one time with a pair of scissors (particularly curved
for that purpose,) laying hold of it with a forceps, left it
should slip away.

Explanation of Fig. 5 Plate CLVIII.

A. The bent probe fixed in a handle, with the ligature
made of the same thread as the ligatures for tying the blood-
veins.

B. The iron instrument for tying the tonsils.

This instrument is also of great service in extirpating, by
ligature, a species of ferruous that sometimes grows from the
neck or cavity of the uterus.

C. The needle with the eye towards the point, for pas-
fing the ligature through the tonsil, when the basis is larger
than the extremity.

D. A canula made of silver to be used in the empyema.

E. A canula to be used in bronchotomy.

To keep the canulas in their place, small ribbands may
be
be paffed through the rings of them, and carried round the body and neck; or they may be held by a ligature run through, and faftened to a hole cut in a piece of focking plaiter, which is to be laid on each side of them.

Of the Polyopus.

The polyopus of the nofe is laid to be an excrecence of flesh, spreading its branches amongst the laminae of the os ethmoidis, and through the whole cavity of one or both noffils. It happens very often to both sides of the nofe at once; and in that cafe is very troublesome, almost suffocationating the patient, at leaft making expiration very difficult. The intent of the operation is the removal of this obfcacle.

Polyopi arise from the membrane spread upon the laminae spongiosa, nearly paffed in the fame manner as the hydatids of the body; in one kind of dropy, do from the surface of the liver; or as ganglions from the tendons, borrowing their coats from a production of its fibres and vessels: If they appear soft, and of the colour of the foam of the blood, in all likelihood they are formed of fuch a fort of water contained in cylinders, which, upon breaking the membrane, leaves fo little hold for the instrument, that but a small part of it can be extracted afterwards. This polyopus is to be left to happen, before the operation be undertaken, which in ferfs of time it generally will do. In the next degree of confidence, they retain pretty nearly the fame colour, and are often partly watery, and partly of a vitcid texture, which though not tenacious enough to admit of drawing them out by the roots, may at fever 1 attempts be taken away by bite. The next degree of confidence, is that which is neither fo soft as to be squeezed to pieces, nor fo hard and bittte as to scrape, or adhere to the membrane with that force as not to admit of separation: this is the moft favourable one. The laff, is hard and firrhous, adhering fo tight as to tear rather than separate in the extraction, and sometimes even tends to degenerate into a cancer: This polyopus is very difficult of cure.

The polyopus sometimes dilates to that degree, as not only to extend beyond the os palati, and hang over the orophagus and trachea; but also spreading into the sinus maxillae, so exactly fills up every interstice of the nofe, as to obstruct the lower orifice of the ductus ad nafum, and prevent the defcent of the teardrops, which neceffarily muft return thro' the puncta lacrimalia; and sometimes they grow fo enormoufly large, as even to alter the fhape of the bones of the face.

When the polyopus appears in the throat, it is always adviceable to confcrt it that way; it being found, by experience, more ready to loofen when paffed in that direction, than by the nofe. To this end, it would be right, before undertaking the operation, to let your patient lie fupine two or three hours, which will bring it down farther down; for the body of the polyopus does not universally adhere, and will by its weight stretch out the fibres by which it is connected to the nofe; nay, there are infences, where by a little effort, fuch as haffing, they have drop quite off.

The method of extracting it is by a pair of forceps, with a flit at their extremities for the better hold, which muft be introduced into the noffill about an inch and a half, to make more sure of it towards the roots; then twifling them a little from one fide to the other, you muft continue in that action, while you pull very gradually the body of the polyopus. If it break, you muft repeat the extrication as long as any remains, unlefs it is attended with a violent haemorrhage, which is an accident that sometimes follows upon the operation, and seldom happens when the extraction is fccurrous: However, the surgeon is not to be alarmed at the appearance of an immoderate effufion the moment after the separation; for, generally speaking, the effusions collapse very soon again; but if they do not, dry hift, or lint dipht in some flypluck, will readily flop it.

After the extirpation, it has been ufual, in order to prevent a relapse, to drefs with efacbroticks powders, and even to burn with the actual cautery; but neither the one or the other can be of great service in this cafe, and both are painful and dangerous. If ever the ufe of corrosive medicines is advisable, it fhou'd be for destroying the remainder of a polyopus which cannot all be taken away; and then the efacbroticks may be better conveyed to the part by a long tube, than a fettom paffed through the nofe and mouth, which is difficult to do without hurting the patient, and very nasty to bear.

Of the Hare Lip.

This difeafe is a fiffure in the upper lip, with want of subftance, and is a natural defect; the patient being always born with it, at leaft that species of hare-lip which requires the following operation. The cure is to be performed by the twifled future. There are many lips, where the lods of subftance is fo great, that the edges of the fiffure cannot be brought together, or at all where they can but jift touch, in which cafe it need not be advifed to forbear the attempt: it is likewise forbidden in infants, and with reafon if they fuck; but otherwife it may be undertaken with great fafety, and even with more probability of fuccefs than in others that are older.

It is not uncommon for the roof of the mouth to be fiffed likewife; but this is no objection to the operation, if the skin of the lip is loofe enough to admit of re union: and it may be remarked, that the fiffure of the palate, in length of years, closes surprifingly in fome cafes.

The manner of doing it is this. You firt with a knife separate the lip from the upper jaw, by dividing the ftrafum between it and the gums; and if the dentes incerti projeft, as is ufual in infants, they muft be cut out with the fame knife; then with a thin pair of frafton fciptas take off the callous edges of the fiffure the whole length of it, obferving the rule of making the new wound in ftraight lines, because the fides of it can never be made to correspond without this caution. For infence, if the hare lip had the shape a, Plate CLVIII. fig. 5 the incifion of the edges muft be continued in ftraight lines till they meet in the manner represented by b, ibid. The two lips of the wound being brought exactly together, pafs a couple of pins, one pretty near the top, and the other as near the bottom, through the middle of both edges of it, and secure them in that situation by twifling a piece of waxed thread crofs and round the pins feven or eight times; you muft then cut off the points, and lay a small bolifter of plaiter underneith them, to prevent their scratching; but when the lower part only of the hare lip can be brought into contact, it will not be proper to ufe more than one pin.

The pins are made three fourths of their lengths of silver, and the other part towards the point of ftee; the silver pin is not quite fo offenive to a wound as a bras or fteel one; but
but a steel point is necessary for their easier penetration, which indeed makes them pass so readily, that there is no need of any instrument to assist in pulling them through. The practice of bolstering the cheeks forward does little or no service to the wound, and is very unsafe to the patient. The manner of dressing will be to remove the applications which are quite superficial, as often only as is necessary for cleanliness. The method is to deforb the third day, and afterwards to do it every day, or every other day: It is not at all requisite to dress between the jaw and lip where the frenulum was wounded, there being no danger that an inconvenient adhesion should ensue. In about eight or nine days the parts are usually united, and in children much sooner, when you must gently cut the threads, and draw out the pins, applying upon-the orifice a piece of plaster and dry lint. It will be proper, in order to withdraw the pins more easily, to daub the ligatures and pins with warm water, and also moisten them with sweet oil, two or three days before you remove them, which will wash off the coagulated blood, that would otherwise fall them so hard to the ligature as to make the extraction painful.

Of the Wry Neck.

The operation of cutting the wry neck is very uncommon, and is never to be practised but when the disorder is owing to a contraction of the masseterous muscle only; as it can answer no purpose to fet that muscle free by dividing it, (which is all that is to be done,) if the others in the neck are in the same state; and more especially if it has been of long standing from infancy; because the growth of the vertebrae will have been determined in that direction, and make it impossible to set the head upright.

When the case is fair, the operation is this. Having laid your patient on a table, make a transverse incision thro' the skin and fat, something broader than the muscle, and not above half an inch from the clavicle; then passing the probed razor with care underneath the muscle, draw it out and cut the muscle. The great vessels of the neck lie underneath; but when we are aware of their situation, the danger of wounding them may be avoided. After the incision is made, the wound is to be cleansed with dry lint, and always dressed so as to prevent the extremities of the muscle from re-uniting; to which end they are to be separated from each other as much as possible by the assistance of a supporting bandage for the head, during the whole time of the cure, which will generally be about a month.

Explanation of Fig. 6. Plate CLVIII.

A. The instrument called the probe razor to cut the mas
toides muscle in the wry neck, and is sharpened only about half its length at that end where the blade is broad.

B. The two pins with the twisted future, used in the hare-lip.

C. The polypus forceps, with one of the rings open for the reception of the thumb, which would be cramped in pulling the forceps with much force, if it were received in the same fort of ring as in the other handle.

Of the Aneurism.

This is a disease of the arteries, in which, either by a preternatural weakness of any part of them, they become excessively dilated, or by a wound through their coats, the blood is extravasated amongst the adjacent cavities. The first species of aneurism is incident to every part of the body, but does not often happen, except to the curvature of the aorta, which is subject to this disorder from the extraordinary impulse of the blood on that part: from the curvature, it runs upwards along the carotids or subclavians, generally increasing, till by its great diffusion it is ruptured, and the patient dies.

There are several histories given of aneurism of the curvature of the aorta; in some of which, the vessel has been so excessively dilated, as to pose off a great space of the upper part of the thorax; and the most curious circumstance to be gathered from them is, that the spot of the vessel which is weakest, and where the disease begins, generally gives way in such a manner to the force of the blood continually pushing it outwards, as to form a large pouch or cyst, with coats nearly as thick as those of the artery itself. However, the thickness of the coats of these cysts will last but to a certain period; for when the vessels of the coats can no longer conform to the extension, the circulation grows languid, the cyst becomes thinner at its apex, and soon after bursts.

The symptoms of this aneurism, are a strong pulsatian against the sternum and ribs; every pulse of the heart; and, when it extends above the sternum, a tumour with pulsation. Upon dissection, the ribs, sternum, and clavicle, are sometimes found cavernous, from the obstruction of the vessels of the pericardium, which are pressed by the tumour.

What we have spoken of hitherto, has been only the aneurism of the thorax from an internal disorder; aneurism of the extremities, are for the most part owing to wounds, though when they happen of themselves, they differ very little from the description given of that in the thorax. The further symptoms of them are (besides pulsation) the tumour's being without discoloration of the skin; its subsiding when pressed by the hand, and immediately returning when the hand is taken away; though, if it be upon the point of bursting, the skin will grow inflamed, and the coagulated blood in the cyst will sometimes make the pulsation much less perceptible.

This species of aneurism may sometimes be supported a great number of years, if we rejoin its dilatation by proper bandage; but if we do not, there is danger of its bursting, and, if it be pretty large, of rotting the adjacent bones.

A found artery wounded through part of its external coat would in all probability produce nearly the same appearances as where the whole coat is weakened from an internal indisposition; and this most likely is the case after bleeding in the arm, when it has not been immediately perceived that the artery was pricked, and the tumour has begun to form some days after the puncture; though the common appearance of an aneurism from the wound of a lancet, is a discharge of blood first through the orifice of the skin, and, upon being dropped from bleeding outwardly, an infusion of it among all the muscles as far as it can spread, in the shoulder and arm: here, the arm grows livid from the ecchymosis, and the blood coagulating to the confidence of flesh, prevents any sensible pulsation. The cyst which arises near the orifice of the artery is formed by the cellular capsula developing the vessels of that part, and a portion of the aponeurosis of the biceps muscle, which admitting of some extravasated blood underneath it, become excessively thickened and expanded. These membranes must make the cyst, otherwise we could not, upon opening the tumour in the o.
peration, discover so readily the puncture; or if the coats of the artery made it, we could not separate it distinctly from the vessel, which would be always dilated above and below the cyst, as we see in other aneurisms.

There are some few instances of small aneurisms and punctures of the artery from bleeding, doing well by bandage; but they almost all require the operation at last, which is to be performed nearly in the same manner in every part; and supposing it in the bend of the arm, is to be done after the following method.

Having applied the tourniquet near the shoulder, and laid the arm in a convenient situation, make an incision on the inside of the biceps muscle, above and below the elbow a considerable length, which, being in the course of the artery, will discover it as soon as you have taken away the coagulated blood, which must be all removed with the fingers, the wound being dilated sufficiently for that purpose. If the orifice does not readily appear, let the tourniquet be loosened, and the effusion of blood will direct you to it; then carefully carrying a crooked needle with a ligature under it, tie the vessel just above the orifice; and pulling the needle again, make a second ligature below it, to prevent the return of the blood, and leave the intermediate piece of the vessel to slough away without dividing it. To avoid wounding or tying the nerve in making the ligature, the artery may be cleared away from it first, and held up with a hook; but should the nerve be tied with the artery, no great inconvenience would ensue from it. After the operation, the arm must be laid easy, on a pillow in bed, and the wound be treated in the common method, keeping it in that posture a fortnight or three weeks, especially if it should swell much, and not digest kindly.

In doing this operation, it will be proper to have the amputating instruments ready, lest it should be impracticable to tie the artery; and even after having tied it, the arm must be carefully watched; and in case of a mortification, it may be taken off.

Of Amputation.

A spreading mortification has been always esteemed to be principally a cause for amputation, that it is a fashion with writers to treat of the nature of a gangrene previous to the description of this operation. However, this operation is spoken of as frequently unsuccessful; and in length of time, its want of success has been so unquestionably confirmed by repeated experiments, that some of the most eminent practitioners make that very circumstance an exception to the operation, which so few years since was the great inducement; and the maxim is, never to extirpate till the mortification is absolutely stopt, and even advanced in its separation.

Gangrenes may be produced two ways; either by indisposition of body, or by accident in a helpless state: for as the life of a part depends upon the circulation of its fluids, whatever shall make the circulation cease, will inevitably occasion a gangrene. Thus a mere compres preventing the course of the blood, as effectually causes a mortification as any indisposition in the fluids or vessels.

It frequently happens in old age, that the arteries of the lower extremities offury; which destroying their elasticity, must in consequence produce a gangrene in the toes first, and afterwards in the limb nearly as high as where the operation terminates; so that in mortifications arising from this cause, we at once fee why amputation, during their increase, is of so little service, unless performed above the ulceration; but we have no way to judge where the incision ends, but by the inference we make from the gangrene's stopping. Hence we may learn the propriety of our modern practice in this case.

If by any accident the limb has been injured to that violent degree as to begin to mortify, it will be no more fit to operate here till it stops, than in the other instance; because all parts that are mortified have lost the disposition to become so, before the effect is produced: and cutting off a limb, half an inch above the absolute dead skin, is generally leaving a part behind, with the seeds of a mortification in it; so, unless we can be sure the vessels are not affected in the place of amputation, which will be hard to know but from the consequence, the operation will be useless.

Sometimes the fluids of the body are so vitiated, as to lose their proper nutritious qualities: and the limb becomes gangrened, not from any alteration in its vessels, but chiefly from its situation, which being at a great distance from the heart, will be more prone to feel the ill effects of a bad blood than any other part, as the circulation is more rapid in the extremities; and it seems not very improbable, that in some dispositions of the blood, a mortification may also be a kind of critical discharge. When therefore a gangrene arising from either of these causes, is running on, amputation above it will for the most part be useless, since it is only removing one degree of the effects of the bad juices, and leaving them in the same state to produce the like mischief in other parts. Thus we see, after amputations on this account, the gangrene sometimes fall on the bowels, or the other extremities: from which observation we may conclude it not safe to amputate, till the fluids are altered; and this alteration will presently discover itself by the stopping of the mortification.

Gunshot wounds, compound fractures, and all sudden accidents requiring amputation, are attended with the best success if immediately performed. Disorders of the joints, ulcers of long standing, and all scrophulous tumours, do sometimes return on other parts after the operation. When a leg is to be amputated, the manner of doing it is this.

Lay your patient on a table two feet six inches high, which is much better than a low seat, both for securing him steady, and giving yourself the advantage of operating without flopping, which is not only painful, but inconvenient in the other situation. While one of the assistants holds the leg, you must roll a strip of fine rag half an inch broad, three or four times round it, about four or five inches below the inferior extremity of the patella: This being pinned on, is to serve as a guide for the knife, which without it perhaps would not be directed so dexterously. The manner of rolling has always been perpendicular to the length of the leg; but having sometimes observed, that though the amputation at first be even, yet afterwards the gastrocnemius muscle contracting, draws back the inferior part of the stump more strongly than the other muscles can do the rest of it; in order to preserve the regularity of the cicatrix, allow for this excess of contraction, and make the circular incision in such a manner that the part of the
wound which is on the calf of the leg is a little farther from the ham than that on the shin is from the middle of the patella.

In the mean time, one of your assistants must carry a strong ligature round the thigh, about three or four inches above the patella, which pulling through a couple of slits in a square piece of leather, he must twist with a tourniquet, till the artery is sufficiently compressed, to prevent any great effusion of blood; and to do it more effectually, he may lay a bolster of tow or linen under the ligature, upon that part where the artery creeps. It will also be a little more easy to the patient, to carry a compres of linen three or four times double, round the thigh, on that part where the ligature is applied, in order to prevent it from cutting the skin.

The course of the blood being stopped, you must begin your incision just below the linen roller, on the under part of the limb, bringing your knife towards you, which at one sweep may cut more than the semicircle; then beginning your second wound on the upper part, it must be continued from the one extremity to the other of the first wound, making them but one line. These incisions must be made quite through the membraa adipofa, as far as the muscles; then taking off the linen roller, and an assistant drawing back the skin as far as it will go, you make your wound from the edges of it when drawn back, through the flesh to the bone, in the same manner as you did through the skin. Before you saw the bones, you must cut the ligament between them, with the point of your knife; and the assistant who holds the leg while it is sawing, must observe not to lift it upwards, which would clog the instrument; and at the same time, not to let it drop, left the weight of the limb should fracture the bone, before it is quite sawed thro'.

In amputating below the knee, it is of advantage to stand on the inside of the leg; because the tibia and fibula lie in a position to be sawed at the same time, if the instrument be applied externally; whereas, if we lay it on the inside of the leg, the tibia will be divided first, and the fibula afterwards; which not only lengthens the operation, but is also apt to splinter the fibula when it is almost sawed thro', unless the assistant be very careful in supporting it.

When the leg is taken off, the next regard is to be had to the flowing the blood, which must be effectually done before the patient is put to bed, or there will be great danger of bleeding again, when the fever is excited, and the vessels of the stump dilated, both which happen a very little while after the operation. There is no method for this purpose so secure, as taking up the extremities of the vessels with a needle and ligature in the following manner. As soon as the amputation is performed, the assistant must loosen the tourniquet for a moment, upon which the orifices of the arteries will appear by the title of the blood. The operator having then fixed his eye upon one of the largest vessels, palls a crooked needle through the flesh, a little more than a quarter of an inch above the orifice, and about the same depth, in such a direction as to make nearly one third of a circle round the vessel; then withdrawing the needle, he a second time passes it into the flesh and out again, in the same manner and about the same distance below the orifice of the vessel. By this means, the thread will almost encompass the vessel, and when it is tied (which should be done by the surgeon's knot) will necessarily inclose it within the stricture. All the considerable arteries are to be taken up in the same manner; that is, the tourniquet is to be loosened in order to discover the vessels, and then the needle is to be passed round. This is a much better way than using the artery forceps, where the vessels are apt to slip away out of the ligature: and as to the tourniquet applications, their want of safety is so well known, that the use of them, in hemorrhages from large vessels, is almost universally rejected; though it is thought by several surgeons who have experienced the virtue of agaric, that it will be found to be a more powerful astringent than any hitherto discovered.

It sometimes happens in a large lump, that ten or more vessels require tying; which done, you must apply loose dry lint to the wound; or in case the small vessels bleed plentifully, you may throw a handful of flour amongst the lint, which will contribute to the more effectual stopping up their orifices. Before you lay on the pledget, you must bind the lump, and begin to roll from the lower part of the thigh down to the extremity of the lump. The use of this roller is to keep the skin forwards, which, notwithstanding the steps already taken to prevent its falling back, would in some measure do so, unless sustained in this manner. The dressing may be secured by the crois cloth and gentle bandage; and the method of treating the wound may be learnt from what has been laid with respect to recent incised wounds.

In amputating the thigh, the first incision is to be made a little more than two inches above the middle of the patella. After the operation, a roller should be carried round the body, and down the thigh, to support the skin and flesh: this is also the most proper bandage, as abscesses will sometimes form in the upper part of the thigh, which cannot discharge themselves conveniently with any other; it being almost impracticable to roll above the abscesses, unless we begin from the body.

The amputation of the arm or cubit differs so little from the foregoing operations, that it will be but a repetition to describe it. However, it must be laid down as a rule, to preserve as much of the limb as possible, and, in all amputations of the upper limbs, to place your patient in a chair.

The amputation of the fingers and toes is better performed in their articulation, than by any of the other methods: for this purpose, a straight knife must be used, and the incision of the skin be made not exactly upon the joint, but a little towards the extremity of the fingers, that more of it may be preferred for the easier healing afterwards; it will also facilitate the separation in the joint, when you cut the finger from the metacarpal bone, to make two small longitudinal incisions on each side of it first. In these amputations, there is generally a vessel or two that require tying, and which often prove troublesome when the ligature is omitted.

It may happen that the bones of the toes, and part only of the metatarsal bones, are carious; in which case, the leg need not be cut off, but only so much of the foot as is done off: a small spring-faw is better to divide with here, than a large one. When this operation is performed, the heel and remainder of the foot will be of great service, and the wound heal up safely.

Explanation of Fig. 7 Plate CLVIII.

A. The figure of the amputating knife. The length of the blade and handle should be about thirteen inches.
B. The figure of the saw used in amputating the limbs. The length of the handle and saw should be about seventeen inches.

Of Luxations.

A Bone is said to be luxated or dislocated, when it is moved out of its place or articulation, so as to impede its proper motion and office.

Luxation of the Nose.

It sometimes happens, that the bones of the nose are separated from each other, or distorted out of their natural places, by some violent blow or fall. When such an accident happens, it is several ways discovered: as, (1.) By the sight, when we behold the deformed position of the nose; or, (2.) By feeling; or lastly, (3.) By the ear, when the patient perceives with what difficulty the patient draws his breath through his nostrils.

When this case happens, the patient is to be speedily placed in a high chair, that an attendant may stand behind and hold his head firm, in a proper posture: the surgeon is then to introduce with one hand, a thick probe, a goose-quill, or little flicke shaped for the purpose, up the nostril internally, by which means the depressed parts of the nose may be thrust into their places: in the mean time he applies his other hand externally, to guide and direct the parts which are moved from within: this being done, there is scarce anything else required but to let a bit of flocking plaster lie upon the nose at the same time.

Of a Dislocation of the Lower Jaw.

The lower jaw is indeed seldom luxated, because it is held firm by strong ligaments and muscles, by whose assistance it is retained in two sinuses in the bafes of the cranium: but when it is by accident forced out from thence, it may chance to be on one side only, or else on both, being then thrust directly forwards: and this happens most frequently from opening the mouth too wide in yawning; though it has sometimes been occasioned by a violent blow or fall. If it be luxated on both sides, the chin will incline downward, and the jaw will be thrust very forward: but if only on one side, the chin will be inclined toward the opposite side; the elapted little head of the jaw not being capable of dislocation but forward and inward; for the processes of the bones of the cranium prevent the jaw from being dislocated backwards.

The lower jaw is chiefly known to be luxated on one side, when the chin is dislocated on the opposite side: for that part to which the chin inclines, is the found; but that from whence it recedes, is the luxated one: the mouth in this case gapes wider than usual, so that the patient cannot shut it, nor eat with his teeth; the lower range of teeth being projected beyond, and on one side the upper: but when the jaw is luxated on both sides, then the mouth not only gapes wide and open, but the chin also hangs down, and is thrown directly forwards; so that the patient cannot shut his mouth, speak diligently, or even swallow anything without much difficulty.

When the jaw is cut only on one side, and the face recent, the cure is usually not so very difficult; but when both heads are dislocated, and not presently restored to their places, it always occasions the worst of symptoms, as pains, inflammations, convulsions, fevers, vomitings, and at length death itself.

When this kind of luxation happens, the patient is to be directly seated on a low stool, so that an attendant may hold his head firm against his breast. Then the surgeon is to thrust his two thumbs as far back into the patient's mouth as he well can; but they are first wrapped round in a handkerchief, to prevent them from slipping or being hurt; and his other fingers are to be applied to the jaw externally: when he has got firm hold of the jaw, it is to be strongly pressed, first downwards, then backwards, and lastly upwards, but so as that they may be all done in one instant; by which means the elapted heads of the jaw may be very easily shoved into their former cavities.

If the jaw be out on one side only, every thing must be done in the same manner: but the luxated side of the jaw must be forced more strongly downward and backward than the found one.

Of Luxations of the Head and Spine.

The luxations which happen in the spine and vertebra of the back are generally imperfect ones. For it appears from an accurate consideration of the structure and articulation of these bones, that none of the vertebra can be entirely displaced without being fractured, and also compressing or wounding the spinal marrow, which must produce danger of infant death. Even the imperfect luxations of these bones are very dangerous: which happen either between the two superior vertebra of the neck and the head, or else between the rest of the vertebra, when they are forced from each other.

Such as have a luxation between the head and upper vertebra, seldom escape being carried off by a speedy and sudden death: for in this case the tender medulla which joins immediately with the brain, and is lodged in the spine, the brain itself, and the nerves which arise beneath the occiput, are too much distended, compressed, or lacerated; the two condyloide processes of the occiput usually slip out of their glenoide sinuses in the first vertebra of the neck, when a person falls headlong from a high place, from off a ladder, from on horseback, or when he receives a violent blow upon his neck: they dying very suddenly in this case, are vulgarly said to have broke their neck, though there is generally no more than a luxation: yet it sometimes happens that the vertebra of the neck are really fractured. If life should remain after such a luxation, which very rarely happens, the patient's head is commonly dislocated with his chin close down to his breast, so that he cannot swallow any thing, nor speak, nor even move any part that is below his neck: therefore, if speedily assistance be not had, death ensues, from the compressure or hurt of the medulla.

But to repulse this unwelcome messenger, the patient is to be immediately laid flat upon the ground or floor: then the surgeon kneeling down with his knees against the patient's shoulders, is to bring them together so as to contain the patient's neck between them: this done, he quickly lays hold of the patient's head with both his hands, and strongly pulling or extensing it, he gently moves it from one side to the other; till he finds, by a noise, the natural position of the neck, and the remission of the symptoms, that the dislocation is properly reduced: by this method the surgeon retains the patient firm between his knees, and
performs the extension and reduction between his hands.

It will be proper, in order to prevent a tumor, and restore the stretched ligaments of the neck to their former vigour, to bathe it with ag. Hungar, fp. vin. camph: or some other strengthening spirit applied warm, as also compresses dipped in the same: the patient should bleed, and rest gently for some days, till the neck be found sufficiently strong and well.

With respect to the rest of the vertebrae of the back, they are seldom moved quite out of their places, unless they are fractured, they being retained, for the greatest part, by adhering to the adjacent ligaments and muscles: therefore the luxations which happen among them are usually imperfect; no more being displaced than their two upper or lower processes, and they often but on one side; and this happens sometimes to one of the spinal vertebrae, and sometimes to more. But it is here to be briefly observed, that it is usual to include among the number of luxated vertebrae, that which is found and firm, but intersepted by others which are not so: thus whenever the upper vertebrae of the loins from the left of the back, and lowermost vertebrae of the loins next the os sacrum, are luxated, we con monly lay and reckon there are five vertebrae out of their places; when, strictly speaking, only the two outermost or the uppermost and lowermost of those vertebrae are disturbed, the three middle ones retaining their natural situation and connection.

The signs common to luxations in the spine dorso are chiefly the following: the back itself is found to be crooked or unequal, after the external violence has been inflicted; the patient can neither stand nor walk, and his whole body seems to be paralytic; the parts which are beneath the luxated vertebrae are nearly without all sense and motion; the excrements and urine cannot be discharged, or else they are sometimes emitted involuntarily; the lower extremities grow dead by degrees; and, at length, death itself follows: but these symptoms vary in proportion to the degree of violence in the luxation.

Luxations of the spinal vertebrae are very difficult to reduce. The following seems to be the most suitable method of reducing luxations of the vertebrae: when the apophyses of the vertebrae are dislocated on both sides, the patient is to be laid leaning upon his belly over a calk, drum, or some other gibbous body; then two assistants are successively to press down both the ends of the luxated spine, on each side; by which means the bones of the spine will be set free from each other, lifted or pulled up in the form of an arch, and so gradually extended. This done, the surgeon presses down the luxated vertebrae, and at the same time nimbly lifts up the inferior part of the body upwards: and by this means the luxated vertebrae are sometimes commodiously reduced into their right places: but, if success should not attend the first time, the method should be repeated two or three times more.

It seems proper, after the vertebrae are reduced, to bathe the spine with fp. vin or to lay on compresses dipped in fp. vin. camph. Afterwards the patient is to be laid in a soft and even bed; bleeding, and bathing the weak parts with strengthening spirits, are to be used as there may be occasion.

Of Luxations of the Os Coccyx, and Ribs.

The os coccyx may be thrust inwards by a violent fall or blow, and it is often pushed outwards in hard birth. When this happens, it is usually attended with violent pain and inflammation about the lower part of the spine, affections form in the inter-sixum rectum, and the fauces are constipated or suppressed. To discover the luxation of this bone the more readily, we have recourse to the use of our hands and eyes, as well as to the knowledge of the forementioned symptoms: nor is the replacing this bone very difficult, if attempted by a careful and expert surgeon; for if it be thrust outwards, it must be depressed into its right place by the thumb, after which may be applied compresses dipped in warm wine, or its spirit, made broad above, and narrow below, to fill up the posterior sinus of the nates; and these may be held on by the T bandage; but that part of this bandage which comes between the thighs should be flat, and placed so that the patient may go to stool without undoing the bandage, and to prevent the bone from being by that means displaced again.

When the os coccyx happens to be luxated inwards, the first finger is to be introduced into the anus. After it has had its nail cut and been dipped in oil, it must be thrust as far as possible, that it may the more readily drive out the depressed bone; the other fingers being applied externally, are to conduct the bone into its right position: when this has been done, it will be proper for the patient to rest some time upon the bed; and when he sits up, it should be in a chair with a hole in its bottom, left the affected part should be otherwise compressed or disturbed.

The ribs are indeed sometimes, though but seldom, dislocated; for upon the assault of some external violence, it is not uncommon for them to be displaced either upwards, downwards, inwards, or outwards. They cannot be easily reduced outwards, because prevented by the vertebral processes, and refitted by very thick and strong muscles: but when they are drove into the cavity of the thorax, they not only lactate the pleura, but do generally great injury to the contained parts; in consequence whereof arise most sharp pains, inflammations, difficulty of breathing, cough, ulcers, immobility, and many other dangerous symptoms of the like nature.

When the rib is dislocated either upwards or downwards, in order to replace it conveniently, the patient is to be laid on his belly upon a table, and the surgeon must strive to reduce the luxated rib into its right place with his hands; or, the arm of the disordered side may be suspended over a gate or ladder, and while the ribs are thus stretched up from each other, the heads of such as are luxated may be pulled into their former seat.

But these luxations wherein the heads of the ribs are forced into the thorax, are generally found to be much the most difficult to reduce; since neither the hand, nor any other instrument, can be applied internally to direct the luxated heads of the ribs: in this case it seems proper to lay the patient on his belly over some gibbous or cylindric body, and to move the fore part of the rib inwards towards the back, slacking it sometimes; for thus generally the head of the luxated ribs slips into its former place: but if this method of cure will avail nothing, and the deplorable condition of the patient requires speedy help, we have no remedy left but incision, and endeavouring to replace the luxated head of the rib with the fingers, pliers, or little hooks. In the mean time, where the symptoms are not very urgent, and the heads of the ribs but little displaced, it is advisable neither to cut the flesh, nor violently force the ribs; be
The clavicles may be dislocated either from the top of the sternum, or processus acromion of the scapula, by some external violence, as a fall, blow, or by pulling it with the hand both inward and outward, without at all moving or bending the scapula; as when the pronation and supination of the hand is made thereby. Both these bones of the cubitus are so articulated with the lower head of the os humeri, that large protuberances are received into deep cavities or grooves, and the whole involved and relieved with exceeding strong ligaments; so that notwithstanding the cubitus may be luxated in all four directions, outward, inward, forward, and backward, yet it is but seldom that it suffers a perfect or entire dislocation, unless the upper part of the ulna, called olecranon, be broken, or the ligaments of the cubitus much weakened, by some very great external violence.

If the cubitus be luxated backward, which is the most frequent of all others, then the arm becomes crooked and shorter, and it cannot be extended. In the inward part of the bend of the arm, the head of the humerus may be observed to stick out; in the back part of the same, the head of the ulna or olecranon will be protuberant, and between both bones will appear a sinus under the olecranon, be broken, or the ligaments of the cubitus much weakened, by some very great external violence.

Of a Luxation of the Cubitus.

The cubitus, consisting of two bones, the ulna and the radius, is articulated by ginly synovial joints. The connection of these bones is such, that the ulna or cubitus, as being the least, or the distal bone, and seated in the inferior part of the arm, does of itself perform the whole flexion and extension of the arm; yet it cannot perform that motion without carrying the radius along with it; so that the radius always follows the ulna in flexion and extension; but, on the other hand, the radius may be turned along with the hand both inward and outward, without at all moving or bending the ulna; as when the pronation and supination of the hand is made thereby. Both these bones of the cubitus are so articulated with the lower head of the os humeri, that large protuberances are received into deep cavities or grooves, and the whole involved and relieved with exceeding strong ligaments; so that notwithstanding the cubitus may be luxated in all four directions, outward, inward, forward, and backward, yet it is but seldom that it suffers a perfect or entire dislocation, unless the upper part of the ulna, called olecranon, be broken, or the ligaments of the cubitus much weakened, by some very great external violence.

As soon therefore as the luxation is discovered in the humerus, the safest way will be to fix the patient on the floor, or on a low stool. Two strong assistants are to be placed on each side the patient: one of which should secure his body, and, if possible, the scapula too, that it may not give way to the extension; while the other lays firm hold of the luxated arm with both his hands, a little above the cubitus, gradually and strongly extending it. But before that extension be made, the surgeon himself should have a large napkin, of sufficient length, tied at the ends, and hung about his neck so that the knot may be behind; but the other part of the napkin must hang over his breast; then the patient's arm must be put through the napkin up to the shoulder, and the surgeon at the same time lays hold of the head of the humerus with both his hands; this done, he orders the assistant to extend the limb sufficiently, and in the mean time he himself elevates the head of the patient's humerus by the napkin about his neck, directing it with his hands, till it slip into its former cavity in the scapula.

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S U R G E R Y.

As soon as the reduction has been by these means effected, the articulation must be bound up with a proper bandage, and the arm is to be afterwards suspended in a napkin or fling about the neck: but care must be taken, that the bandage be not suffered to be on too long, nor the arm to be kept all the time still, without some gentle motion.

On Luxations of the Hand, Carpus, Metacarpus, and Fingers.

Notwithstanding the hand is very accurately connected to the two preceding bones, and particularly to the radius, by means of the carpus and strong ligaments, yet it sometimes suffers luxation in all four directions; but it is generally not so easy to be luxated on either side, as forward or backward, because of the two processes of the radius and ulna, which guard it on each side. The hand is said to be luxated forwards or inwards, when it recedes from the muscles which bend the fingers; to be luxated backwards, when it departs from the muscles which extend the fingers: much also in the same manner, the hand is judged to be luxated outward, when the carpus makes a tumor near the thumb, and a cavity near the little finger; to be luxated inward, when the contrary happens.

It seems to be the safest way immediately to reduce what is displaced; and that this may succeed the better, two things are to be chiefly regarded: (1.) That the luxated hand be sufficiently extended by two assistants, one of which is to lay hold of the hand, and the other of the humerus, pulling in opposite directions: (2.) That the part of the extended hand, where the flexus is, be placed on a table, or some other flat body, that whatever flicks up may be depressed: by which method the hand, in whatever part luxated, may be very readily reduced into its natural seat.

It also sometimes happens, that one or two of the eight little bones of the carpus are luxated and dislocated from their natural seat by some external violence. When this happens, there will be perceived a tumor in one part, and a cavity in another, which may be also felt by the fingers; besides, violent pains will be felt by the patient. For the rest, as this kind of luxation is very easily discovered, partly by the sight, and partly also by feeling; so, when it is recent, it is almost as readily cured, letting the hand be extended in the manner we before proposed, and the dislocated bone be afterwards forced into its place.

The four small bones, which are found in the metacarpus or palm of the hand, may be sometimes luxated from the carpus itself, to which their upper parts are connected; which usually happens from some external violence. The two bones which are placed in the middle between the two other external ones, cannot be dislocated to either side; as the two external ones which sustain the first and little fingers cannot be luxated inwardly, but are more easily driven outward: though each of them may be luxated on the fore or back part of the hand. But which ever of these happens, the particular disorder may be discovered and examined by feeling and inspecting, and the cure may be carried on in altogether the same method which we directed before.

Lastly, The bones of the fingers, to which we join those of the thumbs, are liable to luxation at each of their articulations, and that in several directions. But these accidents, if recent, are both very easy to discover and cure: for the ligaments being not very robust, the fat and muscles thin, and the flexures of the articulations shallow, render the extension very easy, and the reduction of them into their former places may be done very readily. While one hand of the surgeon extends the finger, he thrives with his other to replace the bones in their natural seat.

Of a Luxation of the Thigh.

Very rare is it that the head of the thigh-bone is displaced out of its acetabulum; though formerly it was supposed to be pretty frequent, physicians taking a fracture thereof for a luxation, the reason whereof may be taken from the articulation itself: (1.) How very deep is the fiesus, called by the ancients fiesus coxæ, and by the moderns acetabulum, into which the head of the thigh-bone is received. (2.) With what a broad concave cartilage is almost the whole head of that bone covered. (3.) How strong are the ligaments with which it is stiffened. (4.) How greatly it is defended with exceeding stout and thick muscles. (5.) But how very brittle is the neck of this bone beyond any other part thereof: from all which it appears, that the neck must be far more frequently and easily broke, especially in adults, than its head dislocated: and though something of this kind may sometimes happen, so as to make the head of the thigh-bone flip out of its acetabulum; yet that generally proceeds more from internal than external causes: for we find it has been observed by very skilful physicians, that the ligaments of the thigh-bone, though very strong, may be by various causes, and particularly by a flux of humours, so relaxed and weakened, as to let the head of that bone flip spontaneously out of its acetabulum; so that it should seem no great wonder if the thigh should be sometimes luxated even while the patient lies in bed, without any external violence, so that when they rise, one leg appears longer or shorter than the other, and seems as if it were unhinged.

But this case does not happen so easy in robust adults, as in such as are more young and tender.

Whenever the said head of the thigh-bone is thrust out, it is almost always wholly displaced, so as to make a perfect luxation. The exact roundness of this head, with the great force of the circumjacent muscles, and the narrowness of the fides of the acetabulum, will not admit the bone to be dislocated a little way only; for as soon as the head of this bone is thrust up to the edge of the acetabulum, it must unavoidably either turn quite out, or else fall back again into its right place.

The thigh is usually luxated four ways; upward, downward, backward, and forward: but it is most frequently dislocated downwards and inwards, towards the large foramen in the os pubis: for besides that the cartilaginous defence on the lower part of the acetabulum is not so high as the reff, the ligamentum rotundum is found to give way more easily in that part than any other: and lastly, the adjacent muscles are found to be weakest in their resistance on this part, being insufficient to keep the head of this bone from flipping out; and then there is a certain eminence in this edge of the acetabulum, which keeps the head of the os femoris from falling back again into its right place: but if the head of this bone be dislocated outwards, it generally slips upwards at the same time; it being scarce possible but the very strong muscles of the thigh must then draw the bone upwards, and then there is no eminence there, in the edge of the acetabulum, to resist the head of the bone in that passage; but should it at any time be luxated by an external
ternal force, there must certainly be a rupture of the round ligament.

When the thigh is dislocated forwards and downwards, which is what usually happens, the leg hangs straddling outward, and is longer than the other; also the knee and foot turn outwards; the head of the bone itself will be felt near the lower part of the inguen and os pubis; sometimes there is a suppression of urine in this case; when some nerve, which communicates with the bladder, is violently compressed; in the buttck may be perceived a cavity, from the external force, there must certainly be a rupture of the round ligament.

Whenever the thigh is luxated backward, the patient is to be placed flat on a table, with his face downward; and the thigh is to be extended in directly the same manner, but a little more strongly than we just now proposed; and the reduction is to be effected afterwards by the surgeon's hands, an assistant in the mean time extending the limb, and turning it inwards; by this means the head of the thigh-bone generally slips very readily again into its acetabulum.

Of a Luxation of the Patella and Knee, or Tibia and Fibula.

The patella is usually luxated mostly on the internal or external side of the joint; but whenever the knee is perfectly luxated, the patella can scarce avoid being displaced at the same time, because of its strong connexion to the thigh and tibia.

The reduction of a luxated patella is usually no very great difficulty, if the patient be laid flat on his back upon a table or bed, or if he be laid in that posture upon an even floor, so as that the leg may be pulled out filant by an assistant; for then the surgeon may firmly grasp the patella with his fingers, and afterwards press it strongly into its right place; which may be also effected if the patient stands upright: when this is done, there remains nothing but carefully to bind up the disordered part, and to let the patient rest quietly for some days, sometimes gently bending and extending his leg to prevent it from growing stiff, till the pains are gone off, and the limb has recovered its former strength.

A luxation of the knee is properly so, when the tibia recedes from under the femur. The leg is sometimes luxated from the bals of the thigh-bone, either on the out or inwards, or backwards; seldom or never forwards, unless it be forced and driven very violently that way; because forwards, the patella is bound against the articulation, by the very strong tendons of the muscles which extend the leg; nor is it easy for the bones of the leg to be wholly displaced from that of the thigh, so as to make a perfect luxation; by reason of the great strength of the ligaments, and the two deep sinues which receive the head of the thigh-bone.

As this kind of luxation is very easy to discover from the thin covering of the joint, with the tumors and cavities which follow; so, when it is discovered, it is as difficult to make a perfect cure thereof, without letting the bones join together; or leaving some stiffsness in the knee; which first accident is usually called an ankylosis.

When the knee is but slightly luxated, the patient is to be seated on a bed, bench, or table, and one assistant holds the thigh firm above the knee, and the other extends the leg; but the surgeon in the mean time replaces the bones by his hands and flings if necessary, or pushes it by the application of his knee into its natural place.

Sometimes the fibula is separated by some external violence from the thigh-bone, and is then distorted either upward or downward: and this generally happens, when the foot has been luxated outward; therefore, when this is the case, there is need of extension. The bone is to be first restored...
reflored to its natural place, and then properly bound up.

Of a Luxation of the Foot and Ankle.

The ankle may be sometimes luxated either in jumping, running, or walking; and that in all four directions, inward, outward, backward, and forward. Which of these ways it happens to be luxated, may be discovered by the particular posture of the joint.

The ankle is more or less difficult to reduce, in proportion to the violence of the cause by which it is luxated. But the most ready way of reducing a luxation of the ankle is to place the patient upon a bed, chair, or table, letting the leg and foot be extended in opposite directions by two assistants, while the surgeon drives to reduce the ankle with his hands and fingers. When the foot is by this means once replaced, it is proper to bind it up carefully, after it has been well bathed with oxycrate and salt, advising the patient to keep to his bed a good while, till the disfigure and its symptoms quite leave him.

SURSOLID, in arithmetick and algebra, the fifth power, or fourth multiplication of any number or quantity considered as a root. See Arithmetick and Algebra.

SURVEYING, the art or act of measuring land; that is, of taking the dimensions of any tract of ground, laying down the same in a map or draught, and finding the content or area thereof. See Geometry, p. 699.

SURVEYOR, a person who hath the overfright and care of considerable works, lands, or the like. Surveyor likewise denotes a gauger; as also a person who surveys lands, and makes maps of them.

SURVIVOR, in law, signifies the longest liver of joint tenants, or of any two persons jointly interested in a thing.

SUS, in zoology, a genus of the decandria pentagy. See Arthopoda. The calyx consists of six leaves; and the corolla of five petals; and there are five roundish seeds. There is but one species, a native of America.

SURMOUNTED, in heraldry, is when one figure is laid over another. As the pile surmounted of a chevron in Plate CXLVII, fig. 17.

SURREPTITIOUS. See Subreptitious.

SURREY, a county of England, bounded by the river Thames, which separates it from Middlesex, on the north; by Kent, on the east; by Suffolk, on the south; and by Berkshire, on the west; being thirty-four miles long, and twenty-one broad.

SURROGATE, in law, denotes a person that is substituted, or appointed in the room of another.

SUSDAL, a city of the province of Moscow, in Russia, one hundred miles north-east of Moscow.

SUSSEX, a county of England, bounded by Surrey and Kent on the north, by another part of Kent on the east, by the English channel on the south, and by Hampshire on the west; being sixty-five miles long, and twenty-nine broad.

SUTHERLAND, a shire of Scotland, bounded by Caithness on the north, by the German sea on the east, by the English channel on the south, and by Caithness on the west.

SUTTON GOLEFIELD, a market-town twenty miles north-west of Warwick.

SUTTER, in anatomy. See Anatomy, p. 152.


SWABBER, an inferior officer on board ships of war, whose employment it is to see that the decks are kept neat and clean.

SWABIA, a circle of the German empire, bounded by Bavaria and the palatinate of the Rhine on the north, by Bavaria on the east, by Switzerland and Tyrol on the south, and by the river Rhine, which separates it from Alsace, on the west; being one hundred and thirty miles long, and one hundred and ten broad.

SWALE, a river of Yorkshire, which rising on the confines of Wiltmoreland, runs south-east through Yorkshire, and falls into the Ouse.
SWEDEN, one of the most northerly kingdoms of Europe, bounded by Norwegian Lapland on the north, by Russia on the east, by the Baltic sea on the south, and by Norway on the west; being upwards of eight hundred miles from north to south, and five hundred from east to west.

SWEET, in the wine-trade, denotes any vegetable juice, whether obtained by means of sugar, raisins, or other foreign or domestic fruit, which is added to wines, with a design to improve them.

SWERIN, a town of lower Saxony, in Germany, capital of the duchy of Mecklenburg; and situated on the lake of Swerin: E. long. 11° 30', and N. lat. 54°.

SWERTIA, in botany, a genus of the pentandria digynia class. The corolla is rotated, and there are nectariferous pores at the bases of the different laciniae of the corolla; the capsule has one cell, and two valves. There are five species, only one of them, viz. the perennis, or marsh gentian, a native of Britain.

SWIMMING, the art or act of sustaining the body in water, and of moving therein; in which action the air-bladder and fins of fishes bear a considerable part.

SYMBOL, a sign or representation of something moral, by the figures or properties of natural things. Hence symbols are of various kinds, as hieroglyphics, types, enigmas, parables, fables, &c.

SYMPHISIS, in anatomy. See Anatomy, p. 148.

SYMPHONY, in music, properly denotes a concord of several sounds agreeable to the ear, whether vocal or instrumental, called also harmony.

SYMPHYTUM, in botany, a genus of the pentandria digynia class. The limbus of the corolla is tubular and cleft. There are three species, only one of them, viz. officinale, or comfrey, a native of Britain. The root is used in the medicine.

SYMPHYTUM, in botany, a genus of the pentandria digynia class. The limbus of the corolla is tubular and somewhat ventricose, the sauces being cloased with fubulate radii. There are three species, only one of them, viz. officinale, or comfrey, a native of Britain. The root of the comfrey is a fine mucilage.

SYMPHYSIS, in anatomy. See Anatomy, p. 148.

SYMPHYTUM, in botany, a genus of the pentandria digynia class. The limbus of the corolla is tubular and somewhat ventricose, the sauces being cloased with fubulate radii. There are three species, only one of them, viz. officinale, or comfrey, a native of Britain. The root of the comfrey is a fine mucilage.

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SYNDIC, in government and commerce, an officer in department.

SYNCOPE, fainting, in medicine, a deep and sudden loss of consciousness.

SYNECDOCHE, in rhetoric, a kind of trope, frequent among orators and poets. There are three kinds of synecdoche. By the first, a part is taken for the whole; as the point for the sword, the roof for the house, the hills for the ship, &c. By the second, the whole is used for a part. By the third, the matter whereof the thing is made is used for the thing itself; as steel for sword, silver for money, &c. To which may be added another kind, when the species is used for the genus, or the genus for the species.

SYNEDRION, a word introduced into medicine by the empirics, who mean by it a concourse of symptoms.

SYNÉCDOCHE, in rhetoric, a kind of trope, frequent among orators and poets. There are three kinds of synecdoches. By the first, a part is taken for the whole; as the point for the sword, the roof for the house, the hills for the ship, &c. By the second, the whole is used for a part. By the third, the matter whereof the thing is made is used for the thing itself; as steel for sword, silver for money, &c. To which may be added another kind, when the species is used for the genus, or the genus for the species.

SYNACHUS, or Synocha, in medicine, a term used by Paracelsus, and synonymous with the word Synoecia.

SYNAGOGUE, a particular assembly of Jews met to perform the offices of their religion. Also the place wherein they meet.

SYNAX, in grammar, a contraction of syllables, performed principally by suppressing some vowel or diphthong at the end of a word, on account of another vowel or diphthong at the beginning of the next. As ill' ego, for ille ego, &c.

SYNARTHROSIS, in anatomy. See Anatomy, p. 148.

SYNCHONDROSIS, in anatomy. See Anatomy, p. 148.

SYNCHRONISM, denotes the happening of several things in the same time.

SYNCOPE, fainting, in medicine, a deep and sudden loss of consciousness.

SYNCOPTATION, in rhetoric, denotes the happening of several things in the same time, whereby the distinction of the several times or parts of the measure is interrupted.

SYNCOPE, fainting, in medicine, a deep and sudden loss of consciousness, wherein the patient continues without any sensible heat, motion, sense, or respiration, and is seized with a cold sweat over the whole body, and all the parts turn pale and cold as if dead. See Medicine, p. 157.

SYNCOPE, in grammar, an elision or retrenchment of a letter or syllable out of the middle of a word, as calidus for calidus.

SYNOD, in altrenomy, a conjunction, or concourse of bodies, and the like.

SYNODAL, signifies also a meeting, or assembly of ecclesiastical persons, concerning matters of religion.

SYNODALS, were pecuniary rents, commonly of two shilling, paid to the bishop, or archdeacon, at the time of their Easter visitation, by every parish priest.

SYNODICAL, something belonging to a synod; thus synodal epistles are circular letters written by the synods to the absent prelates and churches, or even those general ones directed to all the faithful, to inform them of what had passed in the synod.

SYNODESIA, in Greek antiquity, a feast celebrated at Athens, in memory of Theseus's having united all the petty communities of Attica into one single commonwealth, the feat whereof was Athens, where all the assemblies were to be held. This feast was dedicated to Minerva; and, according to the school of Thucydides, it was held in the month of Metagitation.

SYNONYMOUS, is applied to a word or term that has the same import or signification with another.

SYNOVIA, in medicine, a term used by Paracelsus, and synonymous with the word Synovia.

SYNOPSEIS, a seat of heretics, who maintained, that there was but one nature and one subsistence in Jesus Christ.

SYRACUSE, a city and port-town of Sicily, in the province of Val de Noto, situated on a fine bay of the Mediterranean sea, on the east coast of the island: in 37° 55' N lat. 15° 15' E. It was the seat of the Levantine commerce, and the like.

SYRAX, a part of Asiatic Turkey, bounded by Natalia and Turcomania, on the north; by Diarbec or Mesopotamia on the east; by Arabia and Palestine on the south; and by the Levant-sea on the west. The Turks divide Syria into three beglerbeglies, or vice-royalties, viz. those of Aleppo, Tripoli, and Damascus; and the like.

SYRINIA, in botany, a genus of the diandria monogynia class. The corolla consists of four segments, and the capsule has two cells. There are two species, both natives of Peria.

SYRINGE, a well known instrument, serving to imbibe or convey a quantity of fluid, and to squirt or expel the same with violence.

SYRINGA, in botany, a genus of the diandria monogynia class. The corolla consists of four segments, and the capsule has two cells. There are two species, both natives of Peria.
TABARCA, an island on the coast of Barbary, in Africa.

TABAGO, one of the Caribbee islands in the American ocean, one hundred and twenty miles south of Barbadoes: W. long. 59°, N. lat. 11° 30'.

TABARCA, an island on the coast of Barbary, in Africa, fifty miles west of Tunis: E. long. 8°, N. lat. 36° 30'.

TABASCO, the capital of a province of the same name, situated on the bay of Campeachy, at the mouth of the river tabasco, one hundred and sixty miles south-west of Campeachy: W. long. 95°, N. lat. 11° 30'.

TABBYING, the palling a silk or fluff under a calender, derived to dissolve slowly, and generally made agreeable to the palate.

TABBY, in commerce, a kind of rich silk which has undergone the operation of tabbying. See the next article.

TABBYING, the palling a silk or fluff under a calender, the rolls of which are made of iron or copper, variously engraved, which bearing unequally on the stuff renders the surface thereof unequal, so as to reflect the rays of light differently, making the representation of waves thereon.

TABELLA, tablet, in pharmacy, is much the same with our notaries-public, who are often called tabelliones in our ancient law-books.

TABELLIO, in the Roman law, an officer or scrivener, much the same with our notaries-public, who are often called tabelliones in our ancient law-books.

TABELLIO, in the Roman law, an officer or scrivener, called tabelliones in our ancient law-books.

TABERNACLE, among the Hebrews, a kind of building, in the form of a tent, set up, by express command of God, for the performance of religious worship, sacrifices, &c. during the journeying of the Israelites in the wilderness; and, after their settlement in the land of Canaan, made use of for the same purpose till the building of the temple of Jerusalem. It was divided into two parts, the one covered, and properly called the tabernacle; and the other open, called the court. The curtains which covered the tabernacle were made of linen, of several colours, embroidered. There were ten curtains, twenty-eight cubits long and four in breadth. Five curtains fastened together made up two coverings, which covered all the tabernacle. Over these there were two other coverings; the one of goat-hair, and the other of sheep skins. The holy of holies was parted from the rest of the tabernacle by a curtain made fast to four pil lars, standing ten cubits from the end. The length of the whole tabernacle was thirty-two cubits, that is, about fifty feet; and the breadth twelve cubits, or nineteen feet. The court was a spot of ground one hundred cubits long, and fifty in breadth, inclosed by twenty columns, each twenty cubits high and ten in breadth, covered with silver, and standing on copper bases, five cubits distant from each other: between which, there were curtains drawn, and fastened with hooks. At the east end was an entrance, twenty cubits wide, covered with a certain hanging loofe.

Feast of Tabernacles, a solemn festival of the Hebrews, observed after harvest, on the fifteenth day of the month Tisri, instituted to commemorate the goodness of God, who protected the Israelites in the wilderness, and made them dwell in booths, when they came out of Egypt. On the first day of the feast, they began to erect booths of the boughs of trees, and in these they were obliged to continue seven days. The booths were placed in the open air, and were not to be covered with cloths, nor made too close by the thickness of the boughs; but left that the fun and the stars might be seen, and the rain descend through them.

TABERNÆMON'TANA, in botany, a genus of the pentandria monogynia class. It has two horizontal follicles; and the seeds are pulpy. There are three species, all natives of America.

TABES, or Consumption. See Medicine, p. 103.

TABLATUR, in music, is, in general, when, to express the sounds or notes of a composition, we use the letters of the alphabet, or any other characters not used in the modern music.

Laws of the Twelve Tables, were the first set of laws of the Romans, thus called, either by reason the Romans then wrote with a stylus on thin wooden tablets covered with wax; or rather, because they were engraved on tables, or plates of copper, to be exposed in the most noted part of the public forum. After the expulsion of the kings, as the Romans were then without any fixed or certain sytem of law, at least had none simple enough to take in the various cases that might fall between particular persons, it was resolved to adopt the best and wisest laws of the Greeks. One Hermodorus was first appointed to...
to translate them, and the decemvirs afterwards compiled and reduced them into ten tables. After a world of care and application, they were at length enacted and confirmed by the senate and an assembly of the people, in the year of Rome 303. The following year they found something wanting therein, which they supplied from the laws of the former kings of Rome, and from certain customs which long use had authorized: all these being engraved on two other tables, made the laws of the twelve tables, so famous in the Roman jurisprudence, the source and foundation of the civil or Roman law.

TABLES of the law, in Jewish antiquity, two tables on which were written the decalogue, or ten commandments, given by God to Moses on Mount Sinai. See Decalogue.

Table, in mathematics, a system of numbers calculated to be ready at hand for the expediting astronomical, geometrical, and other operations.

Astronomical Tables, are computations of the motions, places, and other phenomena of the planets.

TABORITES, a branch or sect of the ancient Huffleites. They carried the point of reformation farther than Hufs had done, rejected purgatory, auricular confession, the use of baptism, transubstantiation, &c. They reduced the seven sacraments of the Romanists to four, viz. baptism, the eucharist, marriage, and ordination.

TABRISTAN, a province of Persia, situated on the north of the Caspian sea, having the province of Asfar bat on the east, and Gilan on the west; being part of the ancient Hycrania.

TACAMAHACA, in pharmacy, a solid resin, improperly called a gum, in the shops: it is of a fragrant and peculiar smell, and is of two kinds; the one called the shell-tacamahaca, which is the finest; the other, which is an inferior kind, being termed rough-tacamahaca, or tacamahaca in grains.

Some greatly commend tacamahaca in disorders of the breast and lungs; but, at present, it is very rarely used internally. Externally, however, it is in repute for softening tumours, and mitigating pain and aches.

TACK, in a ship, a great rope having a wale-knot at one end, which is seized or fastened into the clew of the sail; so is reeved first though the chiefe-trees, and then is brought through a hole in the ship's side. Its use is to carry forward the clew of the sail, and to make it stand close by a wind: and whenever the sails are thus trimmed, the main-tack, the fore-tack, and mizen-tack, are brought close by the board, and haled as much forward on as they can be.

TACK, in Scots law. See Law, Tit. xiii. 8, &c.

TACK-ABOUT, in the sea-language, is to turn the ship about, or bring her head about, so as to lie the contrary way.

TACKLE, among sea-men, denotes all the ropes or cordage of a ship, used in managing the sails, &c.

TACTICS, in the art of war, is the method of disposing forces to the best advantage in order of battle, and of performing the several military motions and evolutions.

TADCASTER, a market-town of Yorkshire, ten miles south west of York.

TADORMA, in ornithology. See ANAS.

TADPOLE, a young frog, before it has disengaged itself from the membranes that envelope it in its first stage of life. See RANA.

TENIA, in zoology, a genus of insects, belonging to the order of vermes zoophyta; the body of which is of an oblong form, and composed of evident joints or articulations, in the manner of the links of a chain, with a mouth and visera in each joint; so that the joints, which are exceedingly numerous, are in some measure so many distinct animals, and can live independent of each other.

There are four species; the folium, or tape-worm, is found in the bowels of men, and filhes, and frequently extends to many yards in length. See Medicine, p. 160.

TENIA, in architecture, a member of the Doric capital, resembling a square fillet, or regret; it serves instead of a cymatium.

TAPPETY, in commerce, a fine smooth silken stuff, remarkably glossy.

TAGESES, in botany, a genus of the fungenia polygama superflux class. The receptacle is naked; the papus has five straight awns; the calix consists of one tubulouis leaf with five teeth; and there are five perisephalous scales in the radius. The species are three, all natives of America.

TAGUS, the largest river of Spain; which, taking its rise on the confines of Aragon, runs south west through the provinces of New Catalonia and Extremadura; and passing by the cities of Aranjuez, Toledo, and Alcantara, and then crossing Portugal, forms the harbour of Lisbon, at which city it is about three miles over; and about eight or ten miles below this, it falls into the Atlantic ocean.

TAJACU, in zoology, a species of hog. See Sus.

TAIL, the train of a beast, bird, or fish; which, in land animals, serves to drive away flies, &c. and in birds and fishes, to direct their course, and affist them in ascending or descending in the air or water.

TAILZIE, in Scots law. See Law, Tit. xxviii. 8, &c.

TAINE, a port-town of Ross-shire, in Scotland, situated on the south side of the frith of Sutherland, seven miles north of Cromarty: W. long. 3° 38', N. lat. 58°.

TALC, in natural history, a large class of fossil bodies, composed of broad, flat, and smooth lamine or plates, laid evenly and regularly on one another; easily filings, according to the size of these plates, but not all so in any other direction; flexible, and elastic; bright, shining, and transparent; not giving fire with steel, nor fermenting with acid menstrua, and retaining the force of a violent fire without calcining.

TALENT, money of account among the ancients. Among the Jews, a talent in weight was equal to 60 maneh, or 113 lb. 10 oz. 1 dwt. 10½ gr.

TALIO, lex taliouis, a species of punishment in the Mosaic law, whereby an evil is returned similar to that committed against us by another; hence that expression, eye for eye, tooth for tooth.

TALISMANS, magical figures cut or engraved with superficialious observations on the charateristics and configurations of the heavens, to which some astrologers have attributed wonderful virtues, particularly that of calling down celestial influences. The talismans of Samothrace, so famous of old, were pieces of iron formed into certain images, and set in rings; these were esteemed preservatives...
TANNING is the art of preparing raw hides or skins for the hand of the currier; or for immediate use, without any further operation.

The first part of this definition includes all leather used for the upper part of shoes, coaches, coach harness, saddle-leather, &c. and the last, the manufacture of bin or backs, &c.

We shall first give a general account of the process of manu-
manufacturing leather comprehended under the first part of the definition; and then explain separately the particular operations comprehended under the general processes.

When the hide or skin is received raw from the hand of the butcher, it is thrown into a water-dub or other piece of water, to cleanse it from the blood and gore; after which, the horns and tail are cut off: then it is put into the lime, and wrought there according to the directions given below; from thence it is wrought into the bate, and cleansed there from the lime, &c. It is next transferred to the ooze; and when properly filled, according to the directions on that head, it is conveyed to the tann-pit, where it is tanned; which when properly filled, according to the directions given below; the horns and tail are cut off: then it is put into the lime, and wrought there according to the directions given below; from thence it is wrought into the bate, and cleansed there from the lime, &c. It is next transferred to the ooze; and when properly filled, according to the directions on that head, it is conveyed to the tann-pit, where it is tanned; which finishes the process.

Before we proceed, it will be necessary to give a short view of the nature and structure of leather, which will contribute to explain the reason of the different operations it passes through.

All hides or skins, when received from the hand of the butcher, are a bundle of connected tubes, somewhat resembling a honeycomb fixed on a basis; on the flesh-side, of an extreme close texture; but all open on the hair or grain side. These tubes contain a fatty or mucilaginous kind of matter; which, if allowed to remain in a fluid state, would corrupt the leather, and, if dried in the hide, would not only occasion a crisp or hardness in the leather, and be easily softened by moisture; but would also, in the course of tanning, in a great measure oppose every substance that can be applied to consolidate and preserve the hide from corruption.

To extract this matter; to swell and expand the pores as much as they can bear, without a diffusion of parts, in order to increase the thickness, and the more easily to re-fill or introduce a matter less subject to changes from drought and moisture; to preserve the fibres that compose the leather from putrefaction; and to consolidate the whole into one durable mass; are the ends proposed by the several operations of tanning.

The extraction of the matter contained in the pores being the first aim of the tanner, the first step is to open and expand the fibres, that the matter may be the more easily ejected, in order to give room for the subsequent reception of the tan. This is done by common laked lime infused in water, and is made up in a pit built with stone, of a length sufficient to contain a packing hide, but seldom so broad as to allow it to lie at its full breadth. The hides are generally treated in the lime in the following manner. They are thrown into a lime-dub, of a weak or flack complexion at first; where they are drawn out and thrown in twice or thrice every day, for a few days. They are then conveyed to a lime of a stronger quality, and drawn as before, though perhaps not so often; once in a day, or once in two days when they are further advanced, may suffice. After they have lain there for ten or fourteen days, the strength of the lime may be increased, or they may be carried to one of a stronger nature, where they are drawn and returned as before till they be completely limed.

As the hastening and retarding the operation in particular cases may be necessary; and as it is material for the quality of the leather, that the lime should make an equal impression upon the hide; or rather, if possible, that the weaker parts should be saved, and the stronger more exposed; the following observation may be of use. In most yards there

are from 20 to 40 hides or upwards wrought in a lime at a time. When these hides are all thrown in, they must necessarily be made to lie spread out upon one another, as close as possible, to take up little room. By this means those that are near the bottom of the pit will be squeezed so closely together by the pressure of the superior hides, that the water, the medium by which the lime is communicated to them, will be almost entirely excluded from acting upon the body of the hide, while the bellies and other outer skirts will be exposed to its full force. For this reason, it is necessary to change their position often, that the different parts of the hides may have nearly the same opportunity of being impregnated with the lime; and in this view, since drawing in the limes is necessary, it is also evident, that no prejudice can accrue to the leather from the frequent repetition of it, but may be greatly hurt if it is neglected. The often drawing of leather must not only bring on the operation more equally, but must at the same time quicken the effect of the lime, as the exposure of the hide to the air and lime by turns will give it an opportunity of acting with greater force. Besides, the workman has it in his power, every time the dub is drawn, either to add new strength to it (if necessary) by giving more lime, or to make it exert the strength it already possesses by stirring or raking the lime from the bottom. Thus the workman has it greatly in his power to accelerate or retard the operation as he shall think proper. Small leather ought to be drawn oftener than large, as it is not so able to resist the strength of the lime. During very hot weather the lime will operate more quickly than in cold; therefore the workman ought to pay a stricter attention to the state of his limes at that time, and draw oftener. The rays of the sun, if allowed to act any time on the leather when it is in the draught, will greatly hurt it.

From the above hints, the workman will be enabled to form some judgment how to vary his work according to the different circumstances that may occur. And here it would seem requisite, that some directions should be given for knowing when the leather is sufficiently limed. But it is impossible to convey ideas in an intelligible manner by words, which can only be acquired by practice and frequent observation. Only we may observe in general, as the hide becomes limed, it leaves the original raw fleshly appearance, has more of the appearance of being boiled, and becomes more plump and fpongy. But all these appearances are the more visible in proportion as the leather is over-done; and therefore it would be extremely dangerous for a person without experience to truft to the above marks. However, though the time taken to perform this operation may be much varied; yet the ordinary time for a middling hide is from 4 to 6 weeks, and so in proportion for larger and smaller leather.

The hide is now stripped of its hair, and all the slimy fatty stuff separated from the leather that is found adhering to the flesh-side; the first of which operations is called hairing, and the last fleshing. After which, as it is the workman's aim to discharge the matter contained in the pores of the leather, as also the particles of lime that may have infinuated themselves during the liming; and as the lime will be found to have communicated a degree of elasticity to the fibres, and a tenacious quality to the matter; it is necessary to unbrace and relax the fibres, and bring the matter-
to be ejected into a greater state of fluidity before we attempt to repel it. An infusion of hen or pigeon dung and water, (which is called a bait,) has been found to be the most effective thing for answering the above end. Into this infusion the hides are thrown promiscuously, where they are drawn in the same manner as directed in the article of liming; and in proportion to the draughts given, the strength of the leather, trim of the bait, &c. the workman will find his point gained from 4 to 8 days: he will find the leather reduced to a soft mellow confidence without any corruption or decay of parts, the matter more fluid and less tenacious, and easily separable from the hide upon working it on the beam with the tanner's knife: but as once working cannot purify the hide, the workman must soak it in water, and work it on the beam, alternately, such a number of times as his judgment shall direct, in order to purge it thoroughly; and as it was observed before, that all the pores of the leather were open on the grain-side, most of the work should be applied on that side. As a putrefaction or corruption of the parts, or an extention of the fibres beyond their proper tone, can never be remedied when once begun, the over-doing or undue management either in baiting or liming, must be equally fatal. To obtain the ends proposed by these two operations, and at the same time to guard against their bad effects, require more experience and knowledge in the nature of leather than any other operation it has afterwards to go through.

Of Oozing.

The hide, when ready for the oozes, ought to be nothing but a bundle of empty tubes void of all fluid matter; that is, composed of nothing but what is called the solids of the hide, without any decay or corruption.

It is now the tanner's business to fill these tubes or pores with a more durable matter, in order to support the fabric of the leather; which is the end of oozing. A number of different substances have been tried for this purpose; but none are equal to oak-bark. This bark, after it is thoroughly dried, is pounded, or rather bruised with a mill or other instrument; the powder is sifted out for the purpose of making up oozes, which is only an infusion of this powder in common water; an old or exhausted ooz (if not begun to corrupt) may be renewed by adding more bark, according to the strength of the oooze required. This liquor is deposited in a number of handlers or duders, (as they are called,) as occasion requires, and the hides are thrown promiscuously into it, where they must be drawn and returned much in the same manner as directed in the article of liming, and carried from a weaker to a stronger ooze as the leather shall require, till they are found to be sufficiently filled. It will be found, that the finer particles of the bark will infinuate themselves into the pores of the leather, and lodge there; and at the same time the astringent quality will strengthen and brace the fibres, and bring them again to their proper tone, after their relaxed state in the bait, which will make the leather appear to swell, and feel plump and soft. Here again no rule can direct an inexperienced person to know when a hide is properly oozed; and indeed some kinds of leather require a greater and some a lesser degree of it, according to the purpose for which it is intended; but in general, there is left danger in oozing plentifully than in being sparing of it, as it always adds to the weight and beauty of the leather. A middling hide may be oozed in three weeks, and sooner or later in proportion to the strength of the ooze, the number of draughts, and heat of the weather.

Of Lopping, or what is more properly called Tanning.

This part of the operation is designed to preserve the fibres from corruption, and at the same time to consolidate the whole into one compact body; or, in some few cases, it may be called lignifying the hide, (if the term may be allowed.) This must evidently be the work of time, as the nature of the fibres must be in a great measure changed, and the new-imbibed matter incorporated and consolidated with them. In order to perform this, the hides are spread out at their full breadth and length in a vat, and a stratum of beat bark thrown between each of them. This vat holds at first as much liquor as will just cover the hides; and in this situation they are allowed to lie till the strength of the bark is thought to be exhausted, which is commonly from four to six weeks; and the operation is repeated till the hides are sufficiently tanned, and which is generally from two to four times, according to the strength of the leather. The bark should be ronder beat, and more given to the lop, for large hides than small ones; and consequently larger leather should lie longer in the lop.

Of Currying.

The leather, when only tanned, is not sufficiently soft and pliable to answer a number of purposes. The currier's province is to reduce the leather to the proper thickness, pliability, and colour, requisite for the different uses to which it is applied; and though there is a material difference in the method of manufacturing the several kinds, and a good deal of dexterity required; yet what could be here said of them would be of little use to those who are unacquainted with the business. We shall therefore reduce all we are to lay on this subject to a general detail of the process.

The leather, after it has dripped some time from the tan-pit, is shaved on an upright beam with a knife whose edge is turned on the one side, and with which the currier can take down the leather in the same manner as a wright can take a shaving from a piece of wood with his plane. After the currier has thus levelled the hide or skin to his purpose, (which is always done on the flesh-side,) he spreads it out on a stone or table made for the purpose, and there scores it on the grain-side from all the loose tan, and other fluff that may hurt the beauty of the grain. He then puts on a certain quantity of oil on both grain and flesh side, for the purpose of softening the fibres, and at the same time making them tough, and hangs it up to dry. When it is sufficiently dry, there is a thin shaving again taken off the flesh-side, in order to clean or brighten it up; and then it is rubbed backward and forward upon a table by the currier with a nicked or furrowed board, keeping the leather always doubled at the place where he rubs, till it be made soft and pliable to his intention. This last part of the operation is properly called Currying, and it is from this that the business gets its name. As to the colour, the leather is fair or dark in proportion to the quantity of oil laid on, if the tanning has been properly performed, and the currier do not neglect some material part of his duty. Curriers seldom dye any colour but black, which is done with copperas and a very little logwood.

TANTALUS's
TARCAVAIL. See Chemistry, p. 98.

TARPEIAN, in Roman antiquity, an appellation given to

TARIF, a table of catalogue, containing the names of dif-

TARTAIS duchy, the south division of Savoy, ha-

TARE, is an allowance for the outside package, that con-

TARANTULA, in zoology. See Aranea.

TARANTO, a port-town of Italy, in the kingdom of

TARAGON, a city and port-town of Spain, in the pro-

TARACON, a city of Spain, in the province of Arragon,

TAR, a thick, black, unctuous substance, obtained from


TAP, a thick, black, unctuous substance, obtained from

TAPPING, in general, the act of piercing an hole in a vef-


TARANTO, a port-town of Italy, in the kingdom of

TARANTULA, in zoology. See Aranea.

TAR, a thick, black, unctuous substance, obtained from

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TARANTULA, in zoology. See Aranea.

TARE, is an allowance for the outside package, that con-

TARP, a thick, black, unctuous substance, obtained from

TARTAIS duchy, the south division of Savoy, ha-

TARE, is an allowance for the outside package, that con-


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latter may be brought, by habit, to relish what at first excited loathing and disgust; yet it does not seem to have been the intention of nature, that the generality of mankind should acquire by custom and experience those sentiments and perceptions which are necessary to their preservation. It is otherwise with the intellectual taste: its formation requires time, instruction, and experience. A young man uninstructed in the arts of music and painting, let his natural sensitiveness be ever so quick and lively, will not immediately distinguish, in a grand concert of music, the various parts whose connection and relation constitute the elegance and charm of the composition; nor will he perceive in a picture the gradations of light and shade, that harmony of colours, that correctness of design, which characterizes a finished piece; but in process of time, and also by degrees, he learns both to hear and to see in a more perfect manner. The same uninstructed person will find a variety of emotions arise in his mind the first time he is present at the representation of a fine tragedy: but he will neither perceive the dexterity of the author in maintaining the unity; nor that exquisite art by which the drama is managed, that no person enters upon the scene nor quits it without an evident reason; nor yet that full more nice and difficult art of making the various subordinate interests terminate and centre in one, which absorbs them all. Thus the only force of habit and reflection, that he will distinguish these several objects of taste, and feel delightful sensations from circumstances of which formerly he had little or no idea.

Elegant and able artists may communicate their feelings and their discernment to others, and thus excite taste in a nation, which, without them, had never known its refined pleasures. By frequently contemplating the works of great and eminent masters in the various arts, the powers of nature arise into taste; and we imbibe, as it were, the spirit of those illustrious men, so as to come at length to look at a gallery of paintings with the eyes of a Le Brun, a Poussin, or a Le Sueur; nay, we even read works of learning and genius with a portion of that spirit that appears in their composition.

If, in the first periods of the culture of the arts and sciences, it has sometimes happened, that a whole nation have been unanimous in the praise of authors full of defects, and whom succeeding ages have beheld with indifference, and even with contempt; the reason is, that these authors had natural beauties which were perceived by all, while that just discernment that was necessary to distinguish their numerous defects, and which is left to the gift of nature, than the result of taste, habit, and reflection, was as yet acquired by none. Thus Lucilius, who had been in the highest reputation among the Romans, sunk into oblivion when Horace arose; and Regnier was universally admired by the French, until Boileau appeared; and if there are several ancient authors, who have maintained their credit, notwithstanding the absurdities that are to be found in every page of their writings, it must be the authors of those nations, among whom no judicious and correct writer has appeared to open their eyes, like Horace among the Romans, and Boileau among the French.

It is a common saying, that there is no disputing about tastes; and if by the taste here be understood the palate, which loves certain aliment and revolts others, the maxim is just; because it is needless to dispute about what cannot be corrected, or to attempt reforming the constitution and mechanism of organs merely corporeal. But the maxim is false and pernicious, when applied to that intellectual taste which has for its objects the arts and sciences. As these objects have real charms, so there is in reality a good taste which perceives them, and a bad one which perceives them not; and there are certain methods by which we may often correct those mental defects which produce a depraved taste. But it must be granted, at the same time, that there are certain phlegmatic spirits, which nothing can enflame; and also certain distorted intellects, which it is impossible to rectify; with such therefore, it is in vain to dispute about tastes, because they have none at all.

In many things taste seems to be of an arbitrary nature, and without any fixed or uniform direction, such as in the choice of dress and equipage, and in every thing that does not come within the circle of the finer arts. In this low sphere it should be distinguished by the name of fancy, rather than taste. In this sphere it is fancied, rather than taste, that produces such an endless variety of new and contradictory modes.

The taste of a nation may degenerate and become extremely depraved; and it almost always happens, that the period of its perfection is the forerunner of its decline. Artists, through the apprehension of being regarded as mere imitators, strike out into new and uncommon paths, and turn aside from the beautiful simplicity of nature, which their predecessors invariably kept in view. In these efforts there is a certain degree of merit, which arises from industry and emulation, and calls a veil over the defects which accompany their productions. The public, fond of novelty, applauds their invention; but this applause is soon succeeded by fatigue and disgust. A new set of artists start up, invent new methods to please a capricious taste, and depart still further from nature than those who first ventured from its paths into the wilds of fancy. Thus the taste of a people degenerates into the grossest corruption. Overwhelmed with new inventions, which succeed and efface each other with incredible rapidity, they scarcely know where they are, and call back their eager and anxious desires towards the period when true taste reigned under the empire of nature. But they implore its return in vain; that happy period cannot be recalled; it departs, however, in the custody of certain choice spirits, the sublime pleasures of true taste, which they cherish and enjoy in their little circle, remote from the profane eye of the depraved and capricious multitude. There are vassal countries, where taste has not yet been able to penetrate. Such are those uncivilized nations, where civil society has never been brought to any degree of perfection, where there is little intercourse between the sexes, and where all representations of living creatures in painting and sculpture are severely prohibited by the laws of religion. Nothing renders the mind so narrow, and so little, if we may use that expression, as the want of social intercourse; this confines its faculties, blunts the edge of genius, damns every noble passion, and leaves it in a state of languor and inactivity very principles that could contribute to the formation of true taste. Besides, where several of the finer arts are wanting, the rest must necessarily languish and decay, since they are inseparably connected together, and mutually support each other. This is one reason, why the Asiatics have never excelled in any of the arts; and hence also it is that true taste has been confined to certain countries in Europe.
TAW (880) TAW

TAW (889) TAW

TATA, or SIND, the capital of a province of the same name in the Hither India, in Asia, situated at the mouth of the Indus: E. long. 68°, N. lat. 25° 45'.

TAT-TOO, a beat of a drum at night, to advertise the soldiers to retreat or repair to their quarters in their garrisons, or to their tents in a camp.

TAU, or Taw, in heraldry, an ordinary in figure of a T, supposed to represent St. Andrew's crofs, or a cross potent, the top part cut off. See CROSS.

TAVASTUS, the capital of the province of Tavastia, in the territory of Finland in Sweden, situated eighty-four miles north-east of Abo: E. long. 24°, N. lat. 61° 20'.

TAUDENT, or Tau'ra, in the sea-language, signifies the name as plait, or fast: thus, to fast taught the throuts on stays, is to make them more light and stiff.

TAVISTOCK, a borough of Devonshire, thirty-two miles south-west of Exeter. It sends two members to parliament, and gives the title of marquis to the noble family of Ruffels dukes of Bedford.

TAUNTON, a borough of Somersetshire, twenty miles south-west of Wells. It sends two members to parliament.

TAURIS, or Tabris, a city of Persia, four hundred miles north of Tifhan: E. long. 46° 30', N. lat. 38° 20'.

TAURUS, the bull, in zoology. See Bos.

TAURUS, in astronomy. See Astronomy, p. 847.

TAUTOLOGY, a needless repetition of the same thing in different words.

TAWING, or Taw (889), the art of dressing skins in white, so as to be fit for divers manufactures, particularly gloves, &c.

All skins may be tawed: but those chiefly used for this purpose are lamb, sheep, kid, and goat skins.

The method of tawing is this: Having cleared the skins of wood or hair, by means of lime, they are laid in a large vat of wood or flone, set on the ground full of water, in which quick-lime has been skimed; wherein they are allowed to lie a month or six weeks, according as the weather is more or less hot, or as the skins are required to be more or less soft and pliant.

While they are in the vat, the water and lime is changed twice, and the skins are taken out and put in again every day; and when they are taken out for the last time, they are laid all night to soak in a running water, to get out the greatest part of the lime; and in the morning are laid together by fives one upon another, upon the wooden leg and are scraped and rubbed one after another, to get the flesh off from the fliny side, with a cutting two-handled instrument called a knife; and then they are cut off the legs, (if they are not cut off before) and other superficial parts about the extremities. Then they are laid in a vat or pit with a little water, where they are fulfilled with wooden pelles, for the space of a quarter of an hour; and then the vat is filled up with water, and they are rinsed in it.

In the next place, they are thrown on a clean pavement to drain, and afterwards cast into a fresh pit of water, out of which they rinse them well, and are laid again on the wooden leg, fix at a time, with the hair-side outwards; over which they rub a kind of whetstone very briskly, to soften and fit them to receive four or five more preparations, given them on the leg, both on the flesh-side and the hair-side, with the knife, after the manner above-mentioned.

After this they are put into a pit of water and wheaten-bran, and stirred about in it with wooden poles, till the bran is perceived to stick to them, and then they are left: as they rise of themselves to the top of the water by a kind of fermentation, they are plunged down again to the bottom; and at the same time fire is set to the liquor, which takes as easily as if it were brandy, but goes out the moment the skins are all covered.

They repeat this operation as often as the skins rise above the water; and when they have done riling they take them out, lay them on the wooden leg, the fliny side outwards, and pass the knife over them to scrape off the bran.

Having thus cleared them of the bran, they lay the skins in a large baker, and load them with huge stones to promote their draining; and when they have drained sufficiently, they give them their feeding, which is performed after the manner following:

For one hundred of large sheep-skins, and for smaller in proportion, they take eight pounds of alum, and three of sea-salt, and melt the whole with water in a vessel over the fire, pouring the dissolution out, while yet lukewarm, into a kind of trough, in which is twenty pounds of the finest wheat flower, with the yecks of eight dozen of eggs; all of which is formed of kind of paste, a little thicker than children's pap; which, when done, is put into another vessel, to be used in the following manner.

They pour a quantity of hot water into the trough in which the paste was prepared, mixing two spoonfuls of the paste with it; to do which they use a wooden spoon, which contains just as much as is required for a dozen of skins: and when the whole is well diluted, two dozen of the skins are plunged into it; but they take care that the water be not too hot, which would spoil the paste and burn the skins.

After they have lain some time in the trough, they take them out, one after another, with the hand, and stretch them out; they do twice; and after they have given them all their paste, they put them into tubs, and there full them afresh with wooden pelles.

Then they put them into a vat, where they are suffered to lie for five or six days, or more; then they take them out in fair weather, and hang them out to dry on cords or racks; and the quicker they are dried the better: for if they be too long a drying, the salt and alum within them are apt to make them rise in a grain, which is an essential fault in this kind of dressing.

When the skins are dry, they are made up into bundles, and just dip in fair water, and taken out and drained; and being thrown into an empty tub, and after having lain some time are taken out and trampled under foot.

Then they draw them over a flat iron-instrument, the top of which is round like a battoedere, and the bottom fixed into a wooden block, to stretch and open them; and having been opened, they are hung in the air upon cords to dry; and being dry, they are opened a second time, by pulling them again over the same instrument.

In the last place they are laid on a table, pulled out, and laid smooth, and are then fit for sale.

TAX, a tribute rated upon every town, which formerly...
TEA, or Thea, in botany, a genus of the polyandria mono-
cycous. A shrub grows to five or six feet high, and is very
vigorously. The leaves are about an inch long, near half an
inch broad, serrated, and terminating in a point. The
corolla consists of five petals, inserted into the receptacle; and the
gynoecium consists of three segments; the female has no stigmas; and the berry
contains one seed. There are two species, both natives of China.

This shrub grows to five or six feet high, and is very
vigorously. The leaves are about an inch long, near half an
inch broad, serrated, and terminating in a point. The
traders in tea distinguish a vast many kinds of it, as they
differ in colour, flavour, and the size of the leaf. To
evaluate the several subdistinguishions were endless; the
common green tea has somewhat small and crumpled leaves,
much convoluted, and closely folded together in the dry-
ing. Its colour is a dusty green, its taint agreeable. It gives the water a strong yel-
lowish green colour. The fine green has larger leaves,
less rumpled and convoluted in the drying, and more
fresh and agreeable, yet more agreeable taste than the for-
der. It gives a pale-green colour to water. To this
kind are to be referred all the higher priced green teas,
the hyson, imperial, &c. The bohea consists of much
smaller leaves than either of the other, and those more
crumpled and closely folded than in either. It is of a
darker colour than the other, often blackish; and is of
the smell and taint of the others, but with a mixed sweet-
ness and astringency. The green teas have all somewhat
of the violet-flavour: the bohea has naturally somewhat of
the rose-flavour. The leaves when gathered are dryed
with great caution, partly by the help of heat, partly
by the air, and when thoroughly prepared will keep a
long time fresh and good. Every parcel, when dryed,
though gathered promiscuously, is separated, according
to the largeness and smallness of the leaves, into three
or four different kinds, each of which is of a different
price, and has its different name. The bohea tea is ga-
thered before the leaves are perfectly opened, and is
made to undergo a greater degree of heat in the curing,
to which its colour and peculiar flavour is in a great mea-
sure owing.

Tea, moderately and properly taken, acts as a gentle
affluent and corroborative.

TEA, in botany. See ANAS.

TEANS, a lymph or aqueous humour, which is subtle,
lipid, and a little saltish: it is separated from the arte-
rial blood by the lachrymal glands, and small gland-
ulous grains on the inside of the eye-lids. See ANATO-
MY, p. 294.

TENETH, the tenth month of the Jewish ecclesiastical
year, and fourth of the civil. It answers to our month
of December.

TECKLENSBURG, a city of Germany, in the circle of
Westphalia, capital of a county of the same name, thir-
teen miles south-west of Olmbrug, subject to its own
count: E. long. 7° 20', N. lat. 52° 21'.

TECHNICAL, expresses somewhat relating to arts or
sciences: in this sense, we say technical terms.

TE DEUM, the name of a celebrated hymn, used in the
Christian church, and so called because it begins with
these words, Te Deum laudamus: "We praise thee, O
God." It is sung in the Romish church, with great pomp
and solemnity, upon the gaining of a victory, or other
happy event.

TEES, a river which rises on the confines of Cumberland;
and running eastward divides the county of Durham
from Yorkshire, and falls into the German sea below
Stockton.

TEFLIS, the capital of Persia; Georgia in Asia, situate on
the river Kura, or Cyrus, three hundred miles north of
Tbilissi, and as many south of Astracan: E. long. 47°
20', N. lat. 43°.

TEGAPEATAN, a port-town of the hither India, in Asia,
near Cape Comorin, eighty miles south of Cochin, and
a hundred and fifty north-west of Colombo in Ceylon: E.
long. 76°, N. lat. 8°.

TEGUMENT, any tiling that surrounds or covers ano-
ther.

TEHAMA, one of the divisions of Arabia Felix in Asia,
situate on the Red-sea, between the provinces of Mecca
and Hadramut.

TEINTS and Semi-teints, in painting, denotes the fe-
veral colours used in a picture, considered as more or less
bright, deep, thin, or weakened, and diminifhed,
&c. to give the proper relief, softness, or diftance, &c.
of the several objects.

TEISSE, or Teys, a river of Hungary, which rises in the
Carpathian mountains; and running from east to west,
passes from Tokay; then turning south, passes by Zol-
neck and Segedin; and having joined the river Merih, falls
into the Danube, opposite to Salankam.

TELEMON, a name given to those figures or half figures
of men so commonly used, instead of columns or pilasters,
to support any member in architecture, as a balcony, or
the like.

TELEPHIUM, in botany, a genus of the pentandria tri-
gynia class. The calyx consists of five leaves; and the
corolla of five petals, inserted into the receptacle; and the
capsule has one cell and three valves. The species are
two, none of them natives of Britain.
TELESCOPE. See Optics, p. 421.

TELESIN, a province of the kingdom of Algiers, in Africa, situated on the confines of the empire of Morocco.

TELLER, an officer of the exchequer, in ancient records called tallier. There are four of these officers, whose duty is to receive all sums due to the king, and to give the clerk of the pells a bill to charge him therewith. They likewise pay all money due from the king, by warrant from the auditor of the receipt; and make weekly and yearly books, both of their receipts and payments, which they deliver to the lord treasurer.

TELICHERRY, a port-town on the Malabar coast, in the Hither India, thirty miles north of Calicut: E. lon. 75° N. lat. 12°.

TEMESWAER, the capital city of the Bannat of Temeswaer, lately annexed to Hungary, sixty miles north-east of Belgrade: E. long. 22°, N. lat. 45° 55'.

TEMPERAMENT, among physicians, denotes the same conformation of the human body, whereby it may be denominated hot, cold, moist, dry, bilious, sanguine, phlegmatic, melancholy, &c.

TEMPLARS, a religious order instituted at Jerusalem, about the year 1118. Some religious gentlemen put themselves under the government of the patriarch of Jerusalem, renounced property, made the vow of celibacy and obedience, and lived like canons regular. King Baldwin assigned them an apartment in his palace. They had likewise lands given them by the king, the patriarch, and the nobility, for their maintenance. At first there were but nine of this order, and the two principal persons were Hugo de Paganis, and Geoffrey of St Omers. About nine years after their institution, a rule was drawn up for them, and a white habit assigned them, by pope Honorius II. About twenty years afterwards, in the popedom of Eugenius III. they had red crosses sewed upon their cloaks, as a mark of distinction; and in a short time they were increased to about three hundred, in their convent at Jerusalem. They took the name of Knights Templars, because their first house stood near the temple dedicated to our Saviour at Jerusalem. This order, after having performed many great exploits against the infidels, became rich and powerful all over Europe; but the knights, abusing their wealth and credit, fell into great disorders and irregularities. Many crimes and enormities being alleged against them, they were proscribed in France, Italy, and Spain; and at last, the pope, by his bull of the 22d of May 1312, given in the council of Vienna, pronounced the extinction of the order of Templars, and united their estates to the order of St John of Jerusalem.

TEMPLE, a general name for places of public worship, whether pagan, Christian, or otherwise. But the word, in a restrained sense, is used to denote the places, or edifices, in which the pagans offered sacrifice to their false gods.

TEMPORAL, a term generally used for secular, as a distinction from ecclesiastical. Thus we say temporal lords, and spiritual or ecclesiastical lords.

TEMPORUM OSSA. See Anatomy, p. 155

TENAILLE, in fortification. See Fortification, p. 619.

TENANT, one that holds lands or tenements of some lord, or landlord, by rent, fealty, &c. See TACK.

TENBURY, a market-town of Worcestershire, fifteen miles north-west of Worcester.

TENBY, a port-town of Pembroke-shire, situated on Bristol channel: W. long. 4° 45', N. lat. 51° 40'.

TENEBRIO, a genus of insects belonging to the ordercoleoptera. The left joint of the antennae is roundish; the breast is somewhat convex, and margined; and the elytra are hard. There are 33 species, principally distinguished by their colour.

TENEDOS, one of the smallest islands of the Archipelago, situated near the coast of Jaffa, west of the ruins of Troy. E. long. 27°, N. lat. 39° 30'.

TENEMENT, property signifies a house; but in a larger sense it is taken for any house, land, rent, or other thing, which a person holds of another.

TENERIF, one of the largest of the Canary Islands, situated in the Atlantic Ocean: W. long. 17°, N. lat. 28°, being about 130 miles in circumference. It is a fruitful island, abounding in corn, wine, and oil; though pretty much incumbered with mountains, of which the most remarkable is that called the Pico of Tenerif, being one of the highest mountains in the world, in the form of a sugar-loaf, the white top whereof may be seen at sea upwards of one hundred miles.

TENES, a province of the kingdom of Algiers, in Africa.

TENEBRUS, in medicine, a name given by medical writers to a complaint which is a continual desire of going to stool, but without any stool being ready to be voided. This is usually attended with some tumour, sometimes with a very considerable one, in the part. This is properly no primary disease, but merely a symptomatic one, and differs in degree according to the disea on which it is an attendant.

TENOR, or Tenour, the purport or content of a writing or instrument in law, &c.

Action of proving the Tenor, in Scots law. See Law, Tit. xxx. 22.

TENOR, in music, the first or principal part, or that which is the ordinary pitch of the voice, when neither raised to a treble, nor lowered to a bass.

TENSE, in grammar, an inflection of verbs, whereby they are made to signify, or distinguish the circumstance of time, in what they affirm. See Grammar.

TENT, in surgery, a roll of lint worked into the shape of a sugar-loaf, the white top whereof may be seen at sea upwards of one hundred miles.

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TERM, in general, signifies much the same with boundary or limit.

TERM, in law, is generally taken for a limitation of time or estate: as a lease for term of life, or years.

TERM, in grammar, denotes some word or expression of a language.

TERM in the arts, or Term of art, is a word which, besides the literal and popular meaning which it has, or may have, in common language, bears a further and peculiar meaning in some art or science.

TERMINALIA, in antiquity, feasts celebrated by the Romans, in honour of the god Terminus.

TERMINATION, in grammar, the ending of a word, or last syllable thereof.

TERNATE, the northernmost of the Molucca or Clove islands, in the possession of the Dutch.

TERRA. See Geography, and Astronomy.

Terra firma, in geography, is sometimes used for a continent, in contradistinction to islands.

Terra del Fuego, an island of South America, from which it is separated by the straits of Magellan.

Ter R/E FILIUS, Son of the Earth, & student of the Romans, in honour of the god Terminus.

TERRENN, at a town of Artois, in the French Netherlands, and thereby the tenant was, at his own expense, obliged to follow his lord into the wars. Knight's service and chivalry; when lands were held of the king, or mefnal lord, to perform service in war. Burgage tenure; land held of the lord of the burrow, at a certain rent.

Terrier is also used for a small hound. See Canis.

TERIER, a book, or roll, wherein the several lands, either of a private person, or of a town, college, church, &c. are described. It should contain the number of acres, and the site, boundaries, tenants names, &c. of each parcel.

TERRIER, in geography, an appellation given to our globe, because consisting of land and water.

TERRAQUEOUS, in geography, an appellation given to the great magnetical globe which we inhabit.

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TERRESTRIAL, something partaking of the nature of earth, or belonging to the globe of the earth: thus we say, the terrestrial globe, &c.

TERRIA, in botany. See Pistacia.

TERIES, in anatomy. See Anatomy, p. 195.

TERGOWISCO, the capital of Wallachia, in European Turkey, eighty miles south-east of Hermannstadt in Transylvania: E. long. 26° 30', N. lat. 45° 35'.
made of curious square marbles, bricks, or tiles, called telesela, from the resembling dice.

Tessin, a river of Italy, which, taking its rise in the Alps, runs through the country of the Grisons and the lake Maggiorn; and then, turning south-east through the Milanese, passes by Pavia, and falls into the Po, a little below that city.

Test, a vessel of the nature of the coppers, used for large quantities of metals at once.

Test-liquor, a liquor used by dealers in brandies, to prove whether they be genuine, or mixed with home-spirit.

Testo, in antiquity, was particularly used among the poets, &c. for the ancient lyre; by reason it was originally made by its inventor Mercury, of the black or hollow shell of the Testudo aquatica, or sea-tortoise, which he accidentally found on the banks of the river Nile.

The Americans find so good account in catching turtle, that they have made themselves very expert at it: they watch them from their nests on shore, in moon-light; and, before they reach the sea, turn them on their backs, and leave them till morning; when they are taken much in the same manner as

Testudo, in antiquity, was a kind of cover or screen which the soldiers, e.g. a whole company, made themselves of their bucklers, by holding them up over their heads, and standing close to each other.

This expedient served to shelter them from darts, stones, &c. thrown upon them, especially those thrown from above, when they went to the assault.

Testudo was also a kind of large wooden tower, which moved on several wheels, and was covered with bullocks hides split, serving to shelter the soldiers when they approached the walls to mine them, or to batter them with rams.

It was called testudo, from the strength of its roof, which covered the workmen as the shell does the tortoise.

Tetanus, in medicine, a convulsive motion that makes any part rigid or inflexible.

Tethys, a genus of fossils belonging to the order of vermes mollusca. The body is oblong, stiffly, and without feet; the mouth consists of a cylindrical proboscis under the duplicate of a lip; and there are two foramina at the left side of the neck. The species are two, both inhabitants of the ocean.

Tetbracoa, botany, a genus of the polyandria class. The calix consists of six leaves; and there are four capsules. There is but one species, a native of America.

Tetrachord, in the ancient music, a concord consisting of four degrees or intervals, and four terms or sounds; called also by the ancients diatessaron, and by us a fourth.

Tetradrachma, in natural history, the name of a genus of fofils, of the class of the felenitae, expressing a rhomboidal body, consisting of fourteen planes.

The characters of this genus are, that the bodies of it are exactly the same form with the common felenite; but that each of the end-planes is divided into two; and there are, by this means, eight of these planes, instead of four.

Tetradriapason, a musical chord, otherwise called a quadruple diapason, or eighth.

Tetradynamia, botany. See Botany, p. 635.

Tetraedron, in geometry, one of the five regular or platonic bodies or solids, comprehended under four equilateral and equal triangles.

Tetragrammaton, a denomination given by the Greeks to the Hebrew name of God, Jehovah, because consisting of four letters.

Tetragonia, in botany, a genus of the icosaedria pentagynia class. The calyx consists of four segments; it has no corolla; and the drupa has four fides, and four cells.

There are two species, both natives of Ethiopia.

Tetragonotheca, in botany, a genus of the Jyngea polygynia superficula class. The receptacle is pellaeous; it has no pappus; and the calyx consists of one leaf, divided into four plain segments. There is but one species, a native of Virginia.

Tetragrammaton, a denomination given by the Greeks to the Hebrew name of God, Jehovah, because consisting of four letters.

Tetrandria, in botany. See Botany, p. 635.

Tetrao, in ornithology, a genus of birds, of the order of gallinacea, distinguished by having the part of the forehead near the eyes naked and papillate. There are 20 species, distinguished principally by their colour, their having rough or naked feet, &c.
TETS.APETALOUS, in botany, an epithet given to flowers that consist of four single petals or leaves.

TETRAPHARMACUM, signifies any remedy consisting of four ingredients.

TETRAPTERA, a name given to insects which have four wings.

TETRAPOTOTE, in grammar, a name given to such defective nouns as have only four caes; such are visis, pecudis, fordis, &c. being deprived of the nominative and vocative singular.

TETRAPHARMACUM, in natural history, the name of a genus of herbs, influenced in their shape by an admixture of particles of tin, and found in form of broad-bottomed pyramids of four sides.

TETRARCH, a prince who holds and governs a fourth part of a kingdom. Such originally was the import of the title tetrarch; but it was afterwards applied to any petty king or sovereign.

TETRASTYLE, in the ancient architecture, a building, and particularly a temple, with four columns in its front.

TETUAN, a town of the empire of Morocco, situated about eight miles from the bay of that name, just within the straits of Gibraltar: W. long. 6° 35′, N. lat. 35° 40′.

TEUCRIUM, in botany, a genus of the polyandria monogynia class. The corolla consists of five waved petals; and the drupa has a double-celled nucleus. There is but one species, a native of America.

TEULONIC, something belonging to the Teutons, an ancient people of Germany, inhabiting chiefly along the coasts of the German ocean: thus, the Teutonic language is the ancient language of Germany, which is ranked among the mother tongues. The Teutonic is now called the German or Dutch.

TEUTONIC ORDER, a military order of knights, established towards the close of the twelfth century, and thus called as consisting chiefly of Germans or Teutons. The origin, &c. of the Teutonic order, is said to be this. The Christians, under Guy of Lusignan, laying siege to Acre, or Acon, a city of Syria, on the borders of the Holy Land, some Germans of Bremen and Lubeck, touched at Land, some Germans of Bremen and Lubeck, touched at Lechtle in the county of Bucks, and falls into the Isis at Dorchester.

THANE, or Thain, a name of an ancient dignity among the English and Scots, or Anglo-Saxons. Skene makes thane to be a dignity equal to the son of an earl. Camden will have it, that thanes' were only dignified by the offices they bore. There were two kinds or orders of thanes; the king's thanes, and the ordinary thanes. The first were those who attended the king in his courts, and who held lands immediately of the king. The ordinary thanes, or the thani minores, were the lords of the manors, who had particular jurisdiction within their limits, and over their own tenants; they changed their names for that of barons, and hence their courts are called courts-baron to this day.

THANE, a little island of ealt Kent, formed by the branches of the Stour and the sea.

THAPSIA, in botany, a genus of the pentandria digynia class. The fruit is oblong, and surrounded with a membrane. There are four species, none of them natives of Britain.

THAWING, the resolution of ice into its former fluid state, by the warmth of the air, &c. See FREEZING.

THEA, in botany. See TEA.

THEATINES, a religious order in the Roman church, called
THEOLOGIA, in botany, a genus of the pentandria class. The calyx consists of five petals; the nectarium is bell-shaped; and the fruit is a woody cortex, of an unequal surface, with five ridges. There are two species, both natives of America.

THEOCRACY, in matters of government, a (late government, by a single person, who is never took from his place by his own will, but never lapses from his place, unless by death or his own consent. This form of government is mentioned in Scripture, as existing among the ancient Egyptians. It was also practiced among the Greeks and Romans.

THEODOLITE, a mathematical instrument much used in surveying. See Geometry, p. 701.

THEOGONY, the branch of the heathen theology, which taught the genealogy of their gods.

THEOLOGY. See Religion.

THEOPHRASTA, in botany, a genus of the pentandria class. The corolla is bell-shaped, and the capsule has one round large cell, and one seed. There are two species, a native of America.

THEOREM, a speculative proposition, demonstrating the properties of any subject.

THEORETIC, something relating to theory, or that terminates in speculation. See Theory.

THEORY, in general, denotes any doctrine which terminates in speculation alone, without considering the practical uses and application thereof.

THERAPEUTIC, a term applied to those who are wholly employed in the service of religion. This general term has been applied to particular sects of men, concerning whom there have been great disputes among the learned.

THERAPEUTICS, that part of medicine which acquaints us with the rules that are to be observed, and the medicines to be employed in the cure of diseases.

THERAPY, certain images, or superstitions figures, mentioned in scripture. Some Jewish writers tell us, the theraphim were effigies of human heads, placed in niches, and consulted as oracles. Others say, they were talismans, or figures of metal, cast and engraved under certain aspects of the planets; to which they ascribed extraordinary effects.

THERIACA ANDROMACHIA, a compound medicine, made in the form of an electuary.

THERMÆ, artificial hot baths, much used by the Romans.

THERMOMETER, an instrument for measuring the increase and decrease of the heat and cold of the air, by means of the elastic and expansive power of bodies of the fluid kind. See Pneumatics, p. 486.

THERMAL, artificial hot baths, much used by the Romans.

THESSALY, now called Epirus, a province of European Turkey.

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THETFORD, the county-town of Norfolk, situated twenty-five miles south-west of Norwich. It sends two members to parliament.

THEURGY, a name given to that part of magic called white magic, or the white art. Those who have written of magic have divided it into three kinds: the first is theurgy, as operating by divine means: the second, natural magic, performed by the powers of nature: and the third, necromancy, which they imagined proceeded from invoking demons.

THIBET, one of the most powerful of the Tartar kingdoms, having China on the east, and India on the west.

THIGH, in anatomy. See Anatomy, p. 200.

THIMBLE, an instrument made of brass, iron, etc., put on the finger to thrust a needle through any cloth, silk, etc. used by all seamstresses, tailors, etc.

THINKING, a general name for any act or operation of the mind. See Logick, and Metaphysics.

THIRLAGE. See Law, Tit. xvi. 12.

THIRSK, a borough-town in the north-riding of York-
fire, situated on the river Swale, sixteen miles north-west of York. It sends two members to parliament.

THIRST, an uneasy sensation, arising from a deficiency in the saliva to moisten the inward parts of the mouth; hence arises a strong desire for drink; it is a symptom generally attending feverish disorders.

THISTLE, in botany. See Carduus.

THIRST, an uneasy sensation, arising from a deficiency in the saliva to moisten the inward parts of the mouth; hence arises a strong desire for drink; it is a symptom generally attending feverish disorders.

THISTLE, in botany. See Carduus.
THORNBURY, a market-town of Gloucestershire, situated twenty miles south-west of Gloucester.

THORNY-IsLAND, an island made by the branches of the Thames formerly, where Westminster-abbey now stands.

THORN-BY, a market-town of Gloucestershire, situated twenty miles south-west of Gloucester.

THORNEY-ISLAND is also an island situated in a bay of the East channel, between Chichester and Portsmouth.

THOUSAND, or Toulouse, a city of France, capital of France, situated on a bay of the Mediterranean sea; E. long. 5°, and N. lat. 43° 39'.

TOULON, or Toulon, a port-town of Provence, in the city of Languedoc, situated on the river Garonne; E. long. 5°, and N. lat. 43° 40'.

THRONE, a royal seat, or chair of state, enriched with ornaments of architecture and sculpture, raised on one or more steps, and covered with a kind of canopy. Such are the thrones in the rooms of audience of kings and other sovereigns.

THROWSTER, one who prepares raw silk for the weaver, by cleaning and twisting it.

THRUSH, in ornithology. See Turdus.

THULE, of the ancients, supposed to be the islands of Orkneys.

THUMB, in anatomy, one of the parts or extremities of the hand. See Anatomy, p. 121.

THUMMIM. See Urim.

THUNDER, a noise in the regions of the air, excited by sudden flashes of lightning. See Electricity, p. 480, 484.

THURINGIA LANDGRAVATE, one of the divisions of the circle of Upper Saxony, in Germany, having the Duchy of Magdeburg on the north, and Franconia on the south.

THURSDAY, the fifth day of the Christian week, but the sixth day of that of the Jews.

THURSO, a port-town of Caithness, in Scotland, situated on the Caledonian ocean, fifteen miles south-west of Dunblane.

THYATIR, a genus of the monochlaennidia class. The calix is aamentum, that of the female a strobilus; neither of them have any corolla; there is one pistillum, and one nut surrounded with an emarginated wing. The species are three, all natives of warm countries.

THYMUS, in botany, a genus of the thymus class. The calix is bilabiated, and the falk is shut up with hairs. There are eight species, two of them natives of Britain, viz. the serpillum, or common thyme; and the acinos, or wild basil.

THYMY, in anatomy. See Anatomy, p. 278.

THYROARYTENOIDES, in anatomy. See Anatomy, p. 301.

THYROIDE CARTILAGE. See Anatomy, p. 300.

THYRSUS, in antiquity, the sceptre which the poets put into the hand of Bacchus. And wherewith they furnished the menades in their bacchanalia.

TIARA, an ornament or habit wherewith the ancient Persians covered their head; and which the Armenians, and kings of Pontus, still wear on medals; these last, because descended from the Persians.

TIAHA is also the name of the pope's triple crown.

TIBER, a great river of Italy, which runs through the pope's territories, passing by Perugia and Orvieto; and having visited Rome, falls into the Tuscian sea at Ollia, fifteen miles below that city.

TIBIA, in anatomy. See Anatomy, p. 183.

TIBIALIS, in anatomy. See Anatomy, p. 209.

TIDES. See Astronomy, p. 473.

TIDE-WAITERS, or TIDESMEN, are inferior officers belonging to the customs-house, whose employment it is to watch or attend upon ships, until the customs be paid: they get this name from their going on board ships, on their arrival in the mouth of the Thames or other port, and so come up with the tide.

TIEND, in Scots law. See Law, Tit. xvii. i., &c.

TIERCE, or TIRCE, a measure of liquid things, as wine, oil, &c. containing the third part of a pipe, or forty-two gallons.
TIGER, in zoology. See Felis.

TIGRIS, a large river of Turky in Asia, which, rising in the mountains of Armenia, runs southward, dividing Dar- 
beek or Mopotamia, from Cursedian or the ancient Af- 
Syria; and having passed by Budagh, joins the Euphrates 
in Eyraea Arabic, or the ancient Chaldea.

TILBURY, a fortres in the county of Essex, situated on 
the river Thames, opposite to Gravesend, twenty miles 
east of London.

TILLIA, in botany, a genus of the polyandria monogynia 
class. The corolla consists of five petals, and the calix of 
five segments; the berry is dry, and round, with five 
cells, and five valves. There are two species, only one 
of them, viz. the Europaea, or lime-tree, a native of 
Britain.

TILLIANA, in botany, a genus of the hexandria mo-

TILTLE. See Agriculture, p. 54.

TILT. in mullick, is an affection of found, whereby we de-
nominate it long or short, with regard to its continuance 
in the same degree of time. See Music.

TIMOR, and illand in the Indian ocean, situated between 
120° and 126° of east long, and between 8° and 10° 
fouth lat.

TIN (83) TOB

TIN, or TIT, or CUEVIOI-MOUNTAINS, are high hills on the 
bottom of hell.

TINTURIE, in grammar, a figure whereby a compound word 
is separated into two parts, and one or more words pla-
ced between them: thus, for quauncungn, Virgil lays, que 
que quauncung vacat tertae, &c.

TITULO, or CHEVIOT-MOUNTAINS, are high hills on the 
scid between them: thus, for quacunquae, Virgil lays, que 
que quauncung vacat terra, &c.

TIT designation of dignity or quality, given to 
princes, and other persons of distinction.

TITMOUSE, in ornithology. See Parus.

TITUBATION, a kind of libration, or shaking, which the 
doth thus, for quacunquae, Virgil lays, que 

TITREM, or CHEVIOT-MOUNTAINS, are high hills on the 
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ced between them: thus, for quacunquae, Virgil lays, que 
que quauncung vacat tertae, &c.
TOMB, includes both the grave or sepulchre wherein ade-

TOLUIFERA, in botany, a genus of the decandria mono-

TOLU, a port-town of Terra Firma, situated on a bay of

TOLERATION, in matters of religion, is either civil or

TOLEN, the capital of Amuria, in Asia: E. long. 37°, and

TOCKAY, a city of Hungary, seventy miles north-east of

TOILET, in general any small instrument, used for making other more complex instruments and machines, as in most operations in the mechanic arts.

TOOL, among mechanics, denotes in general any small instrument, used for making other more complex instruments and machines, as in most operations in the mechanic arts.

TOISE, a French measure containing six of their feet, or

TOILS, snare or nets used by hunters for catching wild

TOOSES, See ANATOMY, p. 188.

TOGA, in Roman antiquity, a wide woolen gown, or

TOLEDO, a city of New Castile, in Spain; the archbi-

TOLEN, the capital of an island of the same name, in the province of Zealand, in the United Netherlands, situated four miles north-west of Bergen-op-Zoom.

TOLLENON, among the Romans, a warlike machine.

TOLU, a port-town of Terra Firma, situated on a bay of the North-Sea, an hundred miles south-west of Carthage.

TOLUM, in matters of literature, denotes a bound book, or writing that just makes a volume.

TOMENTUM, among botanists, the downy matter which grows on the leaves of some plants.

TONE, or TONE, in music, a property of sound, where-

TOPARCHY, a little state or sovereignty, consisting only of

TONGUE, in anatomy. See ANATOMY, p. 304.

TONGUE, in mosaic, a particular manner of laying or clipping the hair of ecclesiastics or monks.

TOMAE, in matters of literature, denotes a bound book, or writing that just makes a volume.

TOPIC.
TOPICAL MEDICINES, are the same with external ones, or those applied outwardly to some diseased and painful part, such as plasters, cataplasm, ungents, &c.

TOPOGRAPHY, a description or draught of some particular place, or small tract of land; as that of a city or town, promontory or tenement, field, garden, house, castle, or the like; such as surveyors set out in their plots, or make draughts of, for the information and satisfaction of the proprietors.

TORNE, the capital of Torne Lapmark, a province of Sweden, situated at the mouth of the river Torne, at the bottom of the Bothnic gulf, upon a little Aland made by Toricelli, a disciple of the great Galileo, which has been already explained in the Treatise of Pneumatics, p. 485.

TORBAY, a fine bay in the English channel, a little east of Dartmouth.

TORCELLA, a port town of Catalonia, in Spain, situated at the mouth of the river Ter, in E. long. 2° 50', and N. lat. 42°.

TORCELLO, in chemistry, is the roasting or scorching of a body by the fire, in order to discharge a part either unnecessary or hurtful in another operation; as sulphur is thus discharged from an ore, before the metal can be obtained to advantage.

TORCH, a luminous used in several church-ceremonies, funerals, &c. and more usually called flambeau.

TORCH-THISTLE, in botany. See CACTUS.

TORDYLIUM, in botany, a genus of the pentandria dicoum clafs. The calyx consists of eight segments, and the corolla of four petals; the seeds are roundish, naked, and fixed to a small dry receptacle. There are two species, both natives of Britain, viz. the latifolium, or purple-flowered great baffard parsley; and the nodosum, or knotted parsley.

TORUS, in architecture, a large round moulding, used in the bases of columns.

TORIFES, in the history of England, a faction or party, opposed to the whigs. See WHIGS.

The Tories are great flickers for the prerogative of the crown, as the whigs are for the liberties and privileges of the people; though, in truth, the principles of the moderate people of both parties do not greatly differ.

TORMENTILLA, in botany, a genus of the icofandria gynia clafs. The calix consists of eight segments, and the corolla of four petals; the seeds are roundish, naked, and fixed to a small dry receptacle. There are two species, both natives of Britain, viz. the erecta, or tormentil; and the reptans, or creeping tormentil.

Tormentil-root has an auffere styptic taste, accompanied with an aromatic flavour: it is one of the most agreeable and efficacious vegetable astringents.

TORNOADO, a sudden and vehement gulf of wind from all quarters, which is suddenly from mountains, whereon there have been great rains, or an extraordinary thaw of snow.

TORRE, in armorics, about the heads of moors, &c.

TORREFACTION, in chemistry, is the roasting or scorching of a body by the fire, in order to discharge a part either unnecessary or hurtful in another operation; as sulphur is thus discharged from an ore, before the metal can be obtained to advantage.

TORDYLIUM, in botany, a genus of the pentandria dicoum clafs. The calix consists of eight segments, and the corolla of four petals; the seeds are roundish, naked, and fixed to a small dry receptacle. There are two species, both natives of Britain, viz. the latifolium, or purple-flowered great baffard parsley; and the nodosum, or knotted parsley.

TORTURE, a grievous pain inflicted on a criminal, or person accused, to make him confess the truth.

TOTNESS, a borough-town of Devonshire, twenty-three miles south-west of Exeter. It sends two members to parliament.

TOUCAN, in ichthyology. See RAMPHASTOS.

Toucan, in aeronautics, P. 487.

TOUCAN, in ichthyology. See RAMPHASTOS.

TOUCAN, in aeronautics, P. 487.

TOUCH-NAIL, among alchemists, refiners, &c. little bars of gold, silver, and copper, combined together in all the different proportions and degrees of mixture; the use of which is to discover the degree of purity of any piece of gold or silver, by comparing the mark it leaves on the touchstone with those of the bars.

TOUR, a luminary used in several church-ceremonies, funerals, &c. and more usually called flambeau.

TOURNIER, among alchemists, refiners, &c. little bars of gold, silver, and copper, combined together in all the different proportions and degrees of mixture; the use of which is to discover the degree of purity of any piece of gold or silver, by comparing the mark it leaves on the touchstone with those of the bars.

The metals usually tried by the touchstone, are gold, silver, and copper, either pure, or mixed with one another in different degrees and proportions, by fusion. In order to find out the purity or quantity of base metal in these various admixtures, when they are to be examined they are compared with these needles, which are mixed in a known proportion, and prepared for this use. The metals of these needles, both pure and mixed, are all made into laminae or plates, one twelfth of an inch broad, and of a fourth part of their breadth in thickness, and an inch and half long; these being thus prepared, you are to engrave on each a mark indicating its purity, or the nature and quantity of the admixture in it.

The black rough marbles, the basaltites, or the softer kinds of black pebbles, are the most proper for touchstones.

Now the method of using the needles and stone is this: the piece of metal to be tried, ought first to be wiped well with a clean towel, or piece of soft leather, that you may the better see its true colour; for from this alone an experienced person will, in some degree, judge beforehand what the principal metal is, and how and with what debaup.
TRACT, in geography, an extent of ground, or a portion TOXICODENDRON, in botany. See Rhus.

TOWN, a place inhabited by a considerable number of people.

TOURNEQUET, in surgery, an instrument made of rollers, compresses, screws, &c. for compressing any wounded part, so as to stop haemorrhages. See Surgery.

TOWER, a tall building, confiding of several stories, usually of a round form, though sometimes square or polygonal.

Towers are built for fortresses, prisons, &c. as the Tower of London, the Tower of the Baffie, &c.

TOWN, a place inhabited by a considerable number of people, being of a middle size between a city and village.

TOXICODENDRON, in botany. See Rhus.

TOZZIA, in botany, a genus of the didynamia angiofermae clasi. The calix has five teeth; and the capsule is round, with one cell, containing a single seed. There is but one species, a native of Switzerland.

TRACHEA, in anatomy. See Anatomy, p. 300.

TRAÇHELIUM, in botany. See Anatomy, p. 300.

TRACHEUM, in botany. See Anatomy, p. 300.

TRACHUS, in anatomy. See Anatomy, p. 295.

TRAGUS, in anatomy. See Anatomy, p. 295.

TRAGUS, in botany. See Anatomy, p. 295.

TRAGIA, in botany, a genus of the moncecia tetrandria clasi. The calix of the male consists of three segments, that of the female of five; neither of them have any corolla; the stylus is trifid; and the capsule has three cells, with solitary seeds. There are five species, none of them natives of Britain.

TRAGOPHTON, in botany, a genus of the fungusca polygamia equalis clasi. The receptacle is naked; the calix is simple, and consists of many leaves; and the pappus is feathered. There are eleven species, two of them natives of Britain, viz. the pratenfe, or yellow goat's-beard; and the porsefolium, or purple goat's-beard.

TRAGUS, in anatomy. See Anatomy, p. 295.

TRAJAN COLUMN, a famous historical column erected in Rome, in honour of the emperor Trajan. It is of the Tuscan order, though something irregular; its height is eight diameters, and its pedestral Corinthian: it was built in a large square there, called Forum Romanum. Its base consists of twelve flones, of an enormous size, and it is raised on a fole, or foot of eight steps; within side is a stair-case, illuminated with forty four windows. It is 140 feet high, which is thirty-five short of the Antonine column, but the workmanship of the former is much more valuable. It is adorned from top to bottom with baso-relievo's, representing the great actions of that emperor against the Dacian.

TRAJECTORY of a comet, is its path or orbit, or the line it describes in its motion. See Astronomy, p. 444.

TRAIN, a line of gun-powder, laid to give fire to a quantity thereof, in order to do execution by blowing up earth, works, buildings, &c.

TRAIN OF ARTILLERY, includes the great guns, and other pieces of ordnance belonging to an army in the field.

TRAIN-OIL, the oil procured from the blubber of a whale by boiling.

TRAINING, or TRAGING, in mineralogy, a term used by the miners, to express the tracing up the mineral appearances on the surface of the earth to their original place, and there finding a mine of the metal they contain. See Mine.

TRALOS MONLES, a province of Portugal, bounded by Spain on the north-east; by the province of Beira on the south; and by Entreminho Douro on the west.

TRANSACTION, an accommodation of some business.
or dispute between two parties, by a mutual and voluntary agreement between them.

TRANSCENDENTAL, or Transcendent, something elevated, or raised above other things; which paffes and transcends the nature of other inferior things.

TRANSCRIPT, a copy of any original writing, particularly that of an act, or instrument, inferred in the body of another.

TRANSFER, in commerce, &c. an act whereby a person surrenders his right, interest, or property in any thing moveable or immoveable to another.

TRANSFORMATION, in general, denotes a change of form, or the assuming a new form different from a former one. The chemists have for a long time been seeking the transformation of metals; that is, their transmutation, or the manner of changing them into gold.

TRANSFUSION, the act of pouring a liquor out of one vessel into another.

TRANSGRESSION, an offence against some law, or a breach or violation thereof.

TRANSILVANIA, a principality bounded by the Carpathian mountains, which divide it from Poland on the north; by Moldavia on the east; by Wallachia, and part of Hungary, on the south; and by another part of Hungary on the north; being about 120 miles long, and almost as many broad; and lying between 22 and 25 degrees east long., and between 45 and 48 of north lat.

TRANSIT, in astronomy, signifies the passage of any planet, just by, or over a fixed star, or the sun, and of the moon in particular, covering or moving over any planet.

TRAVEL, or Transverse, in general, denotes something that goes athwart another, from corner to corner: thus bends and bars, in heraldry, are transverse pieces or bearings: the diagonals of a parallelogram or a square, are transverse lines.

TRAPA, in botany, a genus of the tetrandria monogynia class. The corolla consists of four petals; and the calix of four segments; and the nut has four spines opposite to one another. There is but one species, a native of Asia.

TRAPAZIUM, in geometry, a plane figure contained under four unequal right lines.

TRAPEZIUS, in anatomy. See Anatomy, p. 193.

TRANSPORTATION, the act of conveying or carrying a thing from one place to another.

TRANSUMPTION, in law. See Law, Tit. xxxii. 27.

TRAVELLER, in navigation, is a compound course, wherein several different successive courses and distances are known. See Navigation.

TRAUESTY, a French term, derived from the verb traverser, to disguise one's self, or to appear in masquerade; and hence, travelly is applied to the disfiguring of an author, or the translating him into a style and manner different from his own, by which means it becomes difficult to know him.

TREACLE. See Theriaca.

Some also give the same treacle to melasses.

TREASON, in general, signifies betraying; but is more particularly used for the act or crime of impiety to one's lawful sovereign. See Law, Tit. xxxiii. 9.

TREASURE, in general, denotes a store or stock of money in reserve.

TREASUREER, an officer to whom the treasure of a prince or corporation is committed, to be kept, and duly dispensed of.

The lord high treasurer of Great Britain, or first commissioner of the treasury, when in commission, has under his charge and government all the kings revenue, which is kept in the exchequer. He holds his place during the king's pleasure, being inlittuated by the delivery of a white staff.
TRESPASS, in law, signifies any transgression of the law, and in his gift and disposition are all the officers of the custody in the several parts of the kingdom; executors in every county are nominated by him; he also makes leaves of the lands belonging to the crown.

TREASURY, the place wherein the revenues of a prince are received, preferred, and disbursed.

Lords of the Treasury. In lieu of one single director and administrator of his majesty’s revenues under the title of lord high treasurer, it is at present thought proper to put that office in commission, i.e. to appoint several persons to discharge it with equal authority, under the title of lords commissioners of the treasury.

TREATISE, a set discourse in writing on any subject. A treatise is supposed more express, formal, and methodical than an essay, but less so than a system.

TREATY, a covenant between two or more nations; or the several articles or conditions stipulated and agreed upon between sovereign powers.

TREBLE, in music, the highest or acutest of the four parts in symphony, or that which is heard the clearest and shrillest in a concert.

TREE, the first and largest of the vegetable kind, considered as the foundation and support of all others.

TREBLE, in music, the highest or acutest of the four parts in symphony, or that which is heard the clearest and shrillest in a concert.

TREBLE, in botany. See Menyanthes.

TREFOIL. See Trifolium.

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TREFOIL. See Trifolium.

TREFOIL. See Trifolium.

TREFOIL. See Trifolium.

TREMOR, an involuntary shaking, chiefly of the hands and head, and sometimes of the feet, and sometimes of the tongue and heart.

TRENCHES, in fortification, are ditches cut by the besiegers, that they may approach more securely to the place attacked; whence they are also called lines of approach.

TRENT, a province of Germany, in the circle of Austria, situated on the Alps, which divides Italy from Germany, and sometimes reckoned part of Italy; it is bounded by Tyrol on the north, by the territory of Venice on the east and south, and by the country of the Grisons on the west, being seventy miles long and fifty broad, subject to the house of Austria.

TRENT is also the name of one of the largest rivers in Great Britain, rising in the moor-lands of Staffordshire, and running south-east by Newcastle Under Line, divides that country almost into two equal parts; then entering Derbyshire, turns about to the north-east; and having run the whole length of Nottinghamshire, continues its course due north; at last joining the river Ouse, and several others, it changes its name to that of Humber, and falls into the Germain sea below Hull.

TREPAN. See Surgery, p. 664.


TRESPASS, in law, signifies any transgression of the law, under treason, felony, or misprison of either; but it is most commonly used for any wrong or damage that is done.

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TRESURE, in heraldry, a diminutive of an orle, usually held to be half the breadth thereof. See it represented in Plate CXVII. fig. 20.

TRET, in commerce, an allowance made for the wafte, or the dirt, that may be mixed with any commodity, which is always four pounds in every hundred and four pounds weight.

TRIAL, in law, the examination of a cause, civil or criminal, according to the laws of the land, before a proper judge; or, it is the manner and order observed in the hearing and determining of causes.

TRIANGLE, in geometry, a figure of three sides and three angles. See Geometry, p. 686.

TRIANGULARIS, in anatomy. See Anatomy, p. 306.

TRIBBE, in antiquity, a certain quantity or number of persons, when a division is made of a city or people into quarters or districts.

TRIBRACHYS, in ancient poetry, a foot consisting of three syllables, and those all short, as Melius.

TRIBULUS, in botany, a genus of the decandria monogynia class. The calix consists of five segments, and the corolla of five open petals; it has no stamens; and there are five gynoecia, bristly capsules, containing many seeds.

There are four species, none of them natives of Britain.

TRIBUNAL, in general, denotes the seat of a judge, called in our courts bench.

TRIBUNE, among the ancient Romans, a magistrate chosen out of the commons, to protect them against the oppressions of the great, and to defend the liberty of the people against the attempts of the senate and consuls.

The tribunes of the people were first established in the year of Rome 259. The first design of the creation was to shelter the people from the cruelty of usurers, and to engage them to quit the Aventine mount, whither they had retired in displeasure.

Their number, at first, was but two; but the next year, under the consuls of A. Polthamus Aruncius and Caflius Vifcellitus, there were three more added; and this number of five was afterwards increased by L. Trench to ten. The appellation tribune was given them, by reason they were at first chosen out of the tribunes of the army.

Military Tribun, an officer in the Roman army, who commanded in chief over a body of forces, particularly the division of a legion, much the same with our colonel, or the French mestre de camp.

TRIBUTARY, one who pays tribute to another, in or- dinary.

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TRIBUTE, a tax or impound, which one prince or state is obliged to pay to another as a token of dependence, or in return to live in peace with him, or share in his protection.

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TRIBUTE, a tax or impost, which one prince or state is obliged to pay to another as a token of dependence, or in virtue of a treaty, and as a purchase of peace.

TRICEPS, in anatomy. See Anatomy, p. 205.

TRICHOSTEMA, in botany, a genus of the didynamia class. The upper lip of the corolla is divided; and the stamens are very long. There are two species, both natives of America.

TRICUSPIDES valve, in anatomy. See Anatomy, p. 279.
TRIGONOMETRY.

TRIGONOMETRY is that part of geometry which teaches how to measure the sides and angles of triangles.

Trigonometry is either plane or spherical, according as the triangles are PLANE or SPHERICAL; of each wherein we shall treat in order.

PLANE TRIGONOMETRY.

Plane Trigonometry, or that which teaches the measurement of plane triangles, is commonly divided into rectilinear and oblique-angular.

Of Rectangular Plane Trigonometry.

If in any right-angled triangle, ABC (Plate CLIX, fig. 1. n° 1.) the hypotenuse be made the radius, and with that a circle be described on the one end, A, as a centre; then, it is plain, that BC will be the sine of the angle BAC; and if with the same distance, and on the end B as a centre, a circle be described, it is plain, that AC will be the sine of the angle ABC; therefore, in general, if the hypotenuse of a right-angled triangle be made the radius, the two legs will be the sines of their opposite angles.

Again, if in a right-angled triangle DEF (ibid. n° 2.) one of the legs, as DF, be made the radius, and on the extremity D (at one of the oblique angles, viz. that which is formed by the hypotenuse and the leg made radius) as a centre, a circle be described; it is plain, that the other leg, EF, will be the tangent of the angle at D, and the hypotenuse DF will be the secant of the same angle. The same way, making the leg EF the radius, and on the center E describing a circle, the other leg DF will become the tangent of the angle at E, and the hypotenuse DE the secant of the same.

The chord, sine, tangent, &c. of any arch, or angle, in one circle, is proportional to the chord, sine, tangent, &c. of the same arch in any other circle: from which, and what has been said above, the solutions of the several cases of rectangular trigonometry naturally follow.

Since trigonometry consists in determining angles and sides from others given, there arise various cases; which being seven in rectangular trigonometry, are as follow.

CASE I. The angles, and one of the legs, of a right-angled triangle being given, to find the other leg.

Example. In the triangle ABC (ibid. n° 3.) right-angled at B, suppose the leg AB=36 equal parts, as feet, yards, miles, &c. and the angle A=33° 30'; required the other leg BC, in the same parts with AB.

1. Geometrically: Draw AB=36, from any line of equal parts; upon the point B, erect the perpendicular BC; and, lastly, from the point A, draw the line AC, making with AB an angle of 33° 30'; and that line produced will meet BC in C, and so constitute the triangle. The length of BC may be found by taking it in your compasses, and applying it to the same line of equal parts that AB was taken from.

II. By calculation: First, by making the hypotenuse AC radius, the other two legs will be the sines of their opposite angles, viz. AB the sine of C, and BC the sine of A. Now, since the sine, tangent, &c. of any arch in one circle is proportionable to the sine, tangent, &c. of the same arch in any other circle, it is plain the sines of the angles A and C in the circle described by the radius AC, must be proportional to the sine of the same arches or angles, in the circle, that the table of artificial sines, &c. was calculated for; so the proportion for finding BC will be

S: C :: A: B C

1. i.e. as the sine of the angle C in the tables, is to the length of AB (or line of C in the circle whose radius is AC) so is the sine of the angle A in the tables, to the length of BC.
TRIGONOMETRY.

BC (or line of the same angle in the circle whose radius is AC.) Now the angle A being 33° 40', the angle C must be 56° 20'; therefore looking in the table of artificial sines, &c, for the sines of the two angles, and in the table of logarithms for the logarithm of 86 the given leg, we shall find, by proceeding according to the foregoing proportion, that the required leg BC is 57.28; and the operation will stand as follows:

| 4.93450 | AB 86 |
| 9.74380 | S A 33° 40' |
| 11.67830 | S C 56° 20' |
| 1.75802 | BC 57.28 |

Secondly, making AB the radius, it is plain BC, the leg required, will be the tangent of the given angle A; and so the proportion for finding BC, when AB is made the radius, will be:

$$ R : \tan A :: A B : B C $$

First, making AC the radius, we shall have the following proportion for finding AC, viz.

| 9.82352 | T A 33° 40' |
| 1.93450 | AB 86 |
| 11.75802 | Rad. 90° |

Lastly, by supposing BC the radius, it is plain that AB will be the tangent of C, and the proportion for finding BC will be as follows:

$$ \tan C : T C :: A B : B C $$

Case II. The angles and one of the legs given, to find the hypotenuse.

Example: In the triangle ABC, (ibid. n° 4.) suppose AB 124, and the angle A 34° 20'; consequently the angle C 55° 40', required the hypotenuse AC, in the same parts with AB.

1. Geometrically: This case is constructed after the same manner with the former; and the hypotenuse, AC; is found, by taking its length in your compasses, and applying that line to the same line of equal parts from which AB was taken.

2. By calculation: First, making AC the radius, we shall have the following proportion for finding AC, viz.

| 9.91686 | to the sine of C 55° 40' |
| 1.00000 | to AB 124 |
| 2.09342 | to AC 150.2 |

Secondly, making AB the radius, we have this proportion, viz.

| 10.00000 | i.e. as the radius 90° |
| 10.08314 | to the secant of A 34° 20' |
| 2.09342 | so is AB 124 |
| 2.17656 | to AC 150.2 |

This may also be done, without the help of the secants; for since $$ R : \sec C :: A C : A B $$

| 9.91686 | is to sec C 55° 40' |
| 10.00000 | so is AB 124 |
| 2.09342 | to AC 150.2 |

Thirdly, making BC the radius, we have the following proportion, viz.

| 10.16538 | i.e. as the tangent of C 55° 40' |
| 10.24872 | is to sec C 55° 40' |
| 2.09342 | so is AB 124 |
| 2.17656 | to AC 150.2 |

This likewise may be done without the help of secants; for since $$ T C : \sec C :: A B : A C $$

| 9.91686 | where no secants do appear; and it coincides with that in the first supposition of this case, fo we shall not repeat the operation.

Case III. The angles and hypotenuse given, to find either of the legs.

Example. In the triangle ABC, (ibid. n° 4.) suppose the hypotenuse AC 146, and the angle A 36° 25', consequently the angle C 53° 35', required the leg AB.

1. Geometrically: Draw the line AB at pleasure, and make the angle B A C equal to 36° 25'; then take AC equal to 146 from any line of equal parts; lastly, from the point C, let fall the perpendicular CB, on the line AB. So the triangle is constructed, and AB may be measured from the line of equal parts.

2. By calculation: First, making AC the radius, we shall have the following proportion, viz.

| 10.00000 | i.e. As radius 90° |
| 9.90565 | to the sine of C 53° 35' |
| 2.09342 | so is AB 124 |
| 2.17656 | to AC 150.2 |

This may also be done without the help of secants; for since $$ R : \sec A :: A C : A B $$

| 9.90565 | where no secants do appear; and it coincides with that in the first supposition of this case, so we shall not repeat the operation.

R: Co-S, A:: A C : A B,
Case IV. The two legs being given, to find the angles.

Example. In the triangle ABC, (ibid. n° 5.) suppose AB 94 and BC 56, required the angles A and C.

I. Geometrically: Draw AB equal to 94, from any line of equal parts; then from the point B raise BC perpendicular to AB, and take BC from the former line of equal parts equal to 56; lastly, join the points A and C with the straight line AC: so the triangle is constructed, and the angles may be measured by a line of chords.

II. By calculation: First, supposing AB the radius, we have this analogy, viz.

\[
\frac{AB}{BC} = \frac{R}{\tan \alpha}
\]

i.e. as AB 94 1.97313

is to BC 56 1.74819

to the radius 90° 10.00000

to the tangent of A 47° 9.77506

Secondly, making BC the radius, we have this proportion, viz.

\[
\frac{BC}{BA} = \frac{R}{\sin \alpha}
\]

i.e. as BC 56 1.74819

is to AB 94 1.97313

to the radius 90° 10.00000

to the sine of C 13° 10.22494

Case V. The hypotenuse and one of the legs given, to find the angles.

Example. In the triangle DEF, (ibid. n° 6.) suppose the leg DE = 83, and the hypotenuse DF = 126; required the angles D and F.

I. Geometrically: Draw the line DE = 83 from any line of equal parts; and from the point E raise the perpendicular EF: then take the length of DF = 126, from the same line of equal parts; and setting one foot of your compasses in D, with the other cross the perpendicular EF in E; lastly, join D and F; and the triangle being thus constructed, the angles may be measured by a line of chords.

II. By calculation: First, supposing DF the radius, we have this proportion, viz.

\[
\frac{DF}{DE} = \frac{R}{\cos \alpha}
\]

i.e. as DF 126

is to DE 83 2.10037

to the radius 90° 1.91908

to the sine of F 12° 9.81871

Secondly, by supposing DE the radius, we have this proportion, viz.

\[
\frac{DE}{DF} = \frac{R}{\sec \alpha}
\]

i.e. as DE 83

is to DF 126 2.10037

to the radius 90° 1.91908

to the secant of D 48° 10.18582

This may be done without the help of secants; for since R = sec. Co-S. = R, the foregoing analogy will become this, viz.

\[
\frac{DF}{DE} = \frac{R}{\cos \alpha}
\]

which gives the same answer with that deduced from the first supposition.

Case VI. The two legs being given, to find the hypotenuse.

Example. In the triangle ABD, (ibid. n° 7.) suppose the leg AB = 64, and BD = 56: required the hypotenuse.

I. Geometrically: The construction of this case is performed the same way as in the fourth case, and the length of the hypotenuse is found by taking it in your compasses, and applying it to the same line of equal parts that the two legs were taken from.

II. By calculation: This case being a compound of the fourth and second cases, we must first find the angles by the fourth, thus:

\[
\frac{AB}{DB} = \frac{R}{\tan \alpha}
\]

i.e. as the leg AB 64 1.80618

is to the leg DB 56 1.74819

to the radius 90° 10.00000

to the tangent of A 47° 9.77506

Then by the second case we find the hypotenuse required thus:

\[
\frac{S, A}{R} : \frac{BD}{AD}
\]

i.e. as the sine of A 47° 10.22494

is to the radius 90° 10.00000

to the leg BD 56 1.74819

to the hypoten. AD 83.05 1.92956

This case may also be solved after the following manner, viz.

From twice the logarithm of the greater

fide AB

subtract the logarithm of the lesser

fide BD

and there remains 1.86417

the logarithm of 73.15; to which adding the lesser side BD, we shall have 189.15, whose logarithm is 2.11093

to which add the logarithm of the lesser

fide BD

and the sum will be

3.89512

the half of which is

1.9256

the logarithm of the hypotenuse required.

Or it may be done by adding the square of the two sides together, and taking the logarithm of that sum, the half of which is the logarithm of the hypotenuse required; thus, in the present case, the square of AB (64) is 4096

the square of BD (56) is 3136

the sum of these squares is 7232

the logarithm of which is 3.85926

the half of which is 1.92963

to the logarithm of 85.05, the length of the hypotenuse required.

Case VII. The hypotenuse and one of the legs being given, to find the other leg.

Example. In the triangle BGD, (ibid. n° 8.) suppose the leg BG = 87, and the hypotenuse BD = 142; required the leg DG.

I. Geometrically: The construction here is the same as in case V; the same things being given; and the leg DG is found by taking its length in your compasses, and applying that to the same line of equal parts the others were taken from.

II. By calculation: The solution of this case depends upon the 1st and 5th; and first we must find the oblique angles by case 5th thus:

\[
\frac{DB}{BG} = \frac{R}{\sin \alpha}
\]

i.e. as the hypoth. DB 142 2.15229

is
is to the leg $BG$; its radius $\theta$; to the fine of $D$, $90^\circ$; to the fine of $G$, $97.8723$

Then by case 1st, we find the leg $DG$ required, thus:

$$R : S, B : B : D : D : G,$$

i.e., as radius $90^\circ$, to the fine of $B$, $52^\circ$, 13', $9.89781$, to the hypotenuse $DB$, $142$, $2.15229$, to the leg $DG$, $112.2$, $2.05010$

The leg $DG$ may also be found in the following manner, viz.

To find the log of the sum of the hypotenuse and the given leg, viz. $2.35984$

add the logarithm of their difference, viz. $55$, $1.74036$

and their sum is $4.10020$

and the half of that is $2.05010$

the log of $112.2$ the leg required.

Or it may be done by taking the square of the given leg from the square of the hypotenuse, and the square root of the remainder the leg required: thus, in the present case,

The square of the hypotenuse $(142)$ is $20164$

The square of the leg $BG$ $(87)$ is $7569$

Their difference is $12595$

Whole logarithm is $4.10020$

The half of which is $2.05010$

which answers to the natural number $112.2$ the leg required.

Thus have we gone through the seven cases of right-angled plane trigonometry; from which we may observe, 1. That to find a side, when the angles are given, any side may be made the radius. 2. To find an angle, one of the given sides must of necessity be made the radius.

Of Oblige Angled Plane Trigonometry.

In oblique-angled plane trigonometry, there are six cases; but before we shew their solution, it will be proper to preface the following theorems.

Theorem I. In any triangle $ABC$ (ibid. fig. 2. n° 2.) the sides are proportional to the sines of the opposite angles; thus, in the triangle $A B C$, $A B : B C : C A : S, C : S, A$, and $A B : A C : B C : S, B : S, A$.

Demonstration. Let the triangle $ABC$ be inscribed in a circle; then, it is plain (from the property of the circle) that the half of each side is the sine of its opposite angle: but the sides of these angles, in tabular parts, are proportional to the sines of the same in any other measure; therefore, in the triangle $ABC$, the sine of the angles will be as the halves of their opposite sides; and since the halves are as the wholes, it follows, that the sides of the angles are as their opposite sides; i.e., $S, C : S, A : A B : B C$, &c.

Theorem II. In any plane triangle, as $ABC$ (ibid. n° 2.) the sum of the sides, $AB$ and $BC$, is to the difference of these sides, as the tangent of half the sum of the angles $BAC$, $ABC$, at the base, is to the tangent of half the difference of these angles.

Demon. Produce $AB$; and make $BH$ equal to $BC$; join $HC$, and from $B$ let fall the perpendicular $BE$; through $B$ draw $BD$ parallel to $AC$, and make $HF$ equal to $CD$.

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and an angle opposite to one of them being given, to find
the angle opposite to the other.

Example. In the triangle ABC (ibid. n° 4.) suppose
AB=156, BC=34, and the angle C (opposite to AB)=56°
30'; required the angle A, opposite to BC.

2. Geometrically: Draw the line AC, and at any point
of it, suppose C, make the angle C=56° 30'; then take
CB=84, and with the length of 156 = AB taken in your
compasses from the same scale of equal parts, fixing one
point in B, with the other cross AC in A. Lastly, join
A and B; so the triangle is constructed, and the required
angle A may be measured by a line of chords.

3. By calculation: We have, by theor. 1, the following
proportion for finding the angle A, viz.

\[
\frac{AB}{BC} = \frac{S, C}{S, A}.
\]

\[
\frac{156}{84} = \frac{S, C}{S, A}.
\]

\[
S, C = 9.99250, \quad S, A = 2.06850.
\]

This gives

\[
A = 56° 30'.
\]

Case II. The angles, and a side opposite to one of them,
being given, to find a side opposite to another.

Example. In the triangle HBG (ibid. n° 5.) suppose
the angle H=46° 15', and the angle B=54° 22'; consequently
the angle G=79° 30', and the leg HB=125, required
HG.

Geometrically: Draw HB=125, from any line of equal
parts, and make the angle H=46° 15', and B=54° 22',
then produce the lines HG and BG till they meet one an-
other in the point G; so the triangle is constructed, and HG
is measured by taking its length in your compasses, and ap-
plying it to the same line of equal parts that HB was taken
from.

2. By calculation: By the first of the preceding theorems,
we have this analogy for finding HG, viz.

\[
\frac{HB}{HG} = \frac{S, G}{S, B}.
\]

\[
\frac{125}{HG} = \frac{S, G}{S, B}.
\]

\[
\]

This gives

\[
HG = 62° 45'.
\]

Case III. Two sides and an angle opposite to one of them
given, to find the third side.

Example. In the triangle KLM (ibid. n° 6.) suppose
the side KL=126 equal parts, and KM=130 of these parts,
and the angle L (opposite to KM) = 63° 20', required the
side ML.

1. Geometrically: The construction of this case is the
same as that in Case I, (there being the same things given
in both,) and the leg ML may be measured by applying
it to the same line of equal parts that the other two were
taken from.

2. By calculation: The solution of this case depends up-
on the two preceding ones; and, first, we must find the other
two angles by Case I, thus:

\[
\frac{MK}{S, L} = \frac{S, K}{KL}.
\]

\[
\frac{130}{63° 20'} = \frac{9.99250}{9.93759}.
\]

Then by Case II, we have the required leg ML, thus:

\[
\frac{S, L}{S, K} = \frac{MK}{ML}.
\]

\[
\frac{126}{63° 20'} = \frac{9.99250}{9.93759}.
\]

The leg ML=118.2, required.

N. B. The greater angle is always that subtended by
the greater side; thus, in the present case, the greater angle C,
is subtended by the greater side AD; and the lesser angle
D is subtended by the lesser side AC.

Case V. Two sides and the contained angle being given,
to find the third side.

Example. In the triangle BCD (ibid. n° 8.) suppose
BC=154, BD=133, and the angle B=56° 03'; required the
side CD.

1. Geometrically: The construction of this case is the
same with that of the last, and the length of DC is found
by taking its length in your compasses, and applying it to
the same line of equal parts that the two legs were taken
from.

2. By calculation: The solution of this case depends up-
on the second and fourth; and, first, we must find the angles
by the last case; thus:

\[
\frac{BC}{CD} = \frac{S, A}{S, D}.
\]

\[
\frac{154}{CD} = \frac{S, A}{S, D}.
\]

So is CD 180°.

S, D = 9.99250, \quad S, A = 2.06850.

This gives

\[
CD = 54° 30'.
\]

Their sum is 229°.

And their difference is 23°.

The sum of the three angles A, D, and C, is 180°.

The angle A is 54° 30'.

Their sum is 229°.

And half their sum is 62° 45'.

Then by theor. 2. we have the following proportion, viz.

\[
\frac{AD}{AC} = \frac{S, C}{S, A}.
\]

\[
\frac{AD}{AC} = \frac{9.99250}{2.06850}.
\]

This gives

\[
AD = 72° 30'.
\]

So is KM=130, of them by theorem 3 thus:

\[
\frac{KM}{KL} = \frac{S, L}{S, K}.
\]

\[
\frac{130}{63° 20'} = \frac{9.99250}{9.93759}.
\]

Thus

\[
KL = 62° 45'.
\]

And the sum is the greater angle C = 79° 47'.

Again from half their sum, viz.

\[
KL = 62° 45'.
\]

Take half their difference, viz.

\[
KL = 11° 02'.
\]

And there will remain the lesser angle D = 51° 43'.

So is KM 130.

To ML 118.2.

Case IV. Two sides and the contained angle being given,
to find the other two angles.

Example: In the triangle ACD (ibid. n° 7.) suppose
AC=103, AD=126, and the angle A=54° 30'; required the
angles C and D.

1. Geometrically: Draw AD=126, and make the angle
A=54° 30'; then set off 103 equal parts from A to C:
lastly, join C and D; and so the triangle is constructed,
and the angles C and D may be measured by a line of chords.

2. By calculation: The solution of this case depends up-
on the second and third of the preceding theorems; and, first, we must find the sum and difference of the sides, and half
the sum of the unknown angles, thus:

The leg AD is 126.

The leg AC is 103.

Their sum is 229.

And their difference is 23.

The sum of the three angles A, D, and C, is 180°.

The angle A is 54° 30'.

Their sum is 229°.

And half their sum is 62° 45'.

Then by theor. 2. we have the following proportion, viz.

\[
\frac{AD}{AC} = \frac{S, C}{S, A}.
\]

\[
\frac{126}{103} = \frac{S, C}{S, A}.
\]

This gives

\[
AC = 72° 30'.
\]

So is KM=130, of them by theorem 3 thus:

\[
\frac{KM}{KL} = \frac{S, L}{S, K}.
\]

\[
\frac{130}{63° 20'} = \frac{9.99250}{9.93759}.
\]

Thus

\[
KL = 62° 45'.
\]

And the sum is the greater angle C = 79° 47'.

Again from half their sum, viz.

\[
KL = 62° 45'.
\]

Take half their difference, viz.

\[
KL = 11° 02'.
\]

And there will remain the lesser angle D = 51° 43'.

So is KM 130.

To ML 117.2.

\[
\frac{126}{117.2} = \frac{S, C}{S, A}.
\]

\[
\frac{126}{117.2} = \frac{9.99250}{2.06850}.
\]

This gives

\[
\]

Secondly, we must find the angles C and D.

Example: In the triangle BCD (ibid. n° 8.) suppose
BC=154, BD=133, and the angle B=56° 03'; required the
side CD.

1. Geometrically: The construction of this case is the
same with that of the last, and the length of DC is found
by taking its length in your compasses, and applying it to
the same line of equal parts that the two legs were taken
from.

2. By calculation: The solution of this case depends up-
on the second and fourth; and, first, we must find the angles
by the last case; thus:

\[
\frac{BC}{CD} = \frac{S, A}{S, D}.
\]

\[
\frac{154}{CD} = \frac{S, A}{S, D}.
\]

So is CD 180°.

S, D = 9.99250, \quad S, A = 2.06850.

This gives

\[
CD = 54° 30'.
\]
Is to their difference 21 1.32222
So is the tangent of half the sum of
the angles D and C 61° 58' 10.27372
To the tangent of half their difference 7° 50' 9.13806
So by theorem 2, we have the angles D and C thus:
To half the sum of the angles D and C 61° 58'
Add half their difference 7° 50'

And the sum is the greater angle D 69° 08'
Also, from half the sum 61° 58'
Take half the difference 7° 50'

And there remains the lesser angle C 54° 08'
Then by Case II, we have the following analogy for finding DC the leg required, viz.

S. C : BD : : S. B : DC.

i. e. As the sine of C 54° 08' 9.90869
To BD 133 2 1.21835
So is the sine of B 56° 03' 9.91883
To DC 136.2 2 1.39099

CASE VI. Three sides being given, to find the angles.

Example: In the triangle ABC (ibid. n° 8.) suppose AB=156, AC=185.7, and BC=84; required the angles A, B, and C.

I. geometrically: Make AC=185.7 from any line of equal parts; and from the same line taking 156=AB in your compasses, fix one foot of them in A, and with another sweep an arch; then take 84=BC in your compasses, and fixing one foot in C, with the other sweep an arch, which will cross the former in B: lastly, join the points B and A, and B and C; so the triangle will be constructed, and the angles may be measured by a line of chords.

II. by calculation: Let fall the perpendicular, BD, from the vertex B, upon the base AC; which will divide the base into two segments AD and DC, the lengths whereof may be found by theorem 4. thus:

As the base AC 185 7 2 26893
To the sum of the sides AB and BC 240 2 32801
So is the difference of the sides 72 1 85733

To the diff. of the segments of the base 93 1 06871
And having the sum of the segments viz. the whole base, and their difference, we find the segments themselves, by theorem 3. thus:

To half the sum of the segments 92.8 2 19312
And half their difference 46.5 1 24395
Also from half the sum of the segment 92.8
Take half their difference 46.5

The remainder is the lesser segment DC 46.3

Now the triangle ABC is divided, by the perpendicular DB, into two right-angled triangles, ADB and DBC; in the first of which are given the hypothenus AB=156, and the base AD=139.3, to find the oblique angles, for which we have (by Case V. of rectangular trigonometry) the following analogy, viz.

As AB 156 2 19312
To AD 139.3 2 14395
So is the radius 90° 10 00000

To the co-sine of the angle A 26° 40' 9.95083

Also the angle C is found by the same cafe, thus:

As BC 84 1 92428
To CD 46.3 1 66538
So is the radius 90° 2 00000

To the co-sine of C 56° 30' 9.74120
Having found the two angles A and C, we have the third, B, by taking the sum of the other two from 180, thus:

The sum of all the three angles is 180°
The sum of A and C is 83° 10'

The angle B is 96° 50'

All the proportions used for the solutions of the several cases in plain trigonometry, may be performed by the scale and compass. On the scale there are several logarithmic lines, viz. one of numbers, another of fines, and one of tangents, &c.

And the way of working a proportion by these is this, viz. extend your compasses from the first term of your proportion, found on the scale, to the second; and with that extent, fixing one foot in the third term, the other will reach the fourth term required.

SPHERICAL TRIGONOMETRY.

Spherical Trigonometry is the art whereby, from three given parts of a spheroidal triangle, we discover the rest; and, like plane trigonometry, is either right-angled, or oblique-angled. But before we give the analogies for the solution of the several cases in either, it will be proper to premise the following theorems.

THEOREM I. In all right-angled spherical triangles, the sine of the hypothenuse: radius :: sine of a leg: sine of its opposite angle. And the sine of a leg: radius :: tangent of half the sum: radius.

Demonstration. Let EDAFG (ibid. fig. 3.) represent the eighth part of a sphere, where the quadrantal planes EDFG, EDBC, are both perpendicular to the quadrantal plane ADFB; and the quadrantal plane ADGC is perpendicular to the plane EDFG; and the spherical triangle ABC is right-angled at B, where CA is the hypothenuse, and BA, BC, are the legs.

To the arches GF, CB, draw the tangents HF, OB, and the lines GM CI on the radii DF DB; also draw BL the sine of the arch AB, and CK the sine of AC; and then join IK and OL. Now HF, OB, GM, CI, are all perpendicular to the plane ADFB. And HD, GK, OL, lie all in the same plane ADGC. Also FD, IK, BL, lie all in the same plane ADGC. Therefore, the right-angled triangles HDF, CIK, ODL, having the equal angles HDF, CKI, OLB, are similar. And CI : DG :: GM : CI; that is, as the sine of the hypothenuse: radius :: sine of a leg: sine of its opposite angle. For GM is the sine of the arc GF, which measures the angle CAB. Also, LB : FD :: BO : FI; that is, as the sine of a leg: radius :: tangent of the other leg: tangent of its opposite angle, Q. E. D.

Hence it follows, that the sines of the angles of any oblique spheroidal triangle ACD (ibid. n° 2.) are to one another, directly, as the sines of the opposite sides. Hence it also follows, that, in right-angled spheroidal triangles, having the same perpendicular, the sines of the bases will be to each other, inversely, as the tangents of the angles at the bases.

Theorem
Theorem II. In any right-angled spherical triangle ABC (ibid. n° 3.) it will be, As radius is to the co-sine of one leg, so is the co-sine of the other leg to the co-sine of the hypotenuse.

Hence, if two right-angled spherical triangles ABC, CBD (ibid. n° 2) have the same perpendicular BC, the co-sines of their hypotenuses will be to each other, directly, as the co-sines of their bases.

Theorem III. In any spherical triangle it will be, As radius is to the co-sine of one leg, so is the co-sine of the other leg to the co-sine of the hypotenuse.

Hence, if two right-angled spherical triangles ABC, CBD (ibid. n° 2) have the same perpendicular BC, the co-sines of their hypotenuses will be to each other, directly, as the co-sines of their bases.

Theorem IV. In any right-angled spherical triangle it will be, As radius is to the co-sine of the hypotenuse, so is the tangent of either angle to the co-tangent of the other angle.

As the sum of the sines of two unequal arches is to their difference, so is the tangent of half the sum of those arches to the tangent of half their difference: and, as the sum of the co-sines is to their difference, so is the co-tangent of half the sum of the arches to the tangent of half the difference of the same arches.

Theorem V. In any spherical triangle ABC (ibid. n° 4 and 5.) it will be, as the co-tangent of half the sum of half their difference, so is the co-tangent of half the base to the tangent of the distance (DE) of the perpendicular from the middle of the base.

Since the last proportion, by permutation, becomes co-tang. \( \frac{AC+BC}{2} \) : co-tang. AE : : tang. \( \frac{AC-BC}{2} \) : tang. DE; and as the tangents of any two arches are, inversely, as their co-tangents; it follows, therefore, that tang. AE : tang. \( \frac{AC+BC}{2} \) :: tang. \( \frac{AC-BC}{2} \) : tang. DE, or, that the tangent of half the base is to the tangent of half of the sum of the sides, as the tangent of half the difference of the sides to the tangent of the distance of the perpendicular from the middle of the base.

Theorem VI. In any spherical triangle ABC (ibid. n° 4) it will be, as the co-tangent of half the sum of the angles at the base, is to the tangent of half of their difference, so is the tangent of half the vertical angle to the tangent which the perpendicular CD makes with the line CF bisecting the vertical angle.

The Solution of the Cases of right-angled spherical Triangles, (ibid. n° 3.)

<table>
<thead>
<tr>
<th>Case</th>
<th>Given</th>
<th>Sought</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>The hyp. AC and one angle A</td>
<td>The opposite leg BC</td>
<td>As radius : fine hyp. AC :: fine A : fine BC (by the former part of theor. 1.)</td>
</tr>
<tr>
<td>2</td>
<td>The hyp. AC and one angle A</td>
<td>The adjacent leg AB</td>
<td>As radius : co-sine of A :: tang. AC : tang. AB (by the latter part of theor. 1.)</td>
</tr>
<tr>
<td>3</td>
<td>The hyp. AC and one angle A</td>
<td>The other angle C</td>
<td>As radius : co-sine of AC :: tang. A : co-tang. C (by theorem 4.)</td>
</tr>
<tr>
<td>4</td>
<td>The hyp AC and one leg AB</td>
<td>The other leg BC</td>
<td>As fine AB : radius :: co-sine AB : co-sine BC (by theorem 2.)</td>
</tr>
<tr>
<td>5</td>
<td>The hyp AC and one leg AB</td>
<td>The opposite angle C</td>
<td>As fine AC : radius :: fine AB : fine C (by the former part of theorem 1.)</td>
</tr>
<tr>
<td>6</td>
<td>The hyp AC and one leg AB</td>
<td>The adjacent angle A</td>
<td>As tang. AC : tang. AB :: radius : co-sine A (by theorem 1.)</td>
</tr>
<tr>
<td>7</td>
<td>One leg AB and the adjacent angle A</td>
<td>The other leg BC</td>
<td>As radius : fine AB :: tangent A : tangent BC (by theorem 4.)</td>
</tr>
<tr>
<td>8</td>
<td>One leg AB and the adjacent angle A</td>
<td>The opposite angle C</td>
<td>As radius : fine A :: co-sine of AB : co-sine of C (by theorem 3.)</td>
</tr>
<tr>
<td>9</td>
<td>One leg AB and the adjacent angle A</td>
<td>The hyp. AC</td>
<td>As co-sine of A :: radius :: tang. AB : tang. AC (by theorem 1.)</td>
</tr>
<tr>
<td>10</td>
<td>One leg BC and the opposite angle A</td>
<td>The other leg AB</td>
<td>As tang. A : tang. BC :: radius : fine AB (by theorem 4.)</td>
</tr>
<tr>
<td>11</td>
<td>One leg BC and the opposite angle A</td>
<td>The adjacent angle C</td>
<td>As co-sine BC :: radius :: co-sine of A : fine C (by theorem 3.)</td>
</tr>
<tr>
<td>12</td>
<td>One leg BC and the opposite angle A</td>
<td>The hyp. AC</td>
<td>As fin. A : fin. BC :: radius : fin. AC (by theorem 1.)</td>
</tr>
<tr>
<td>13</td>
<td>Both legs AB and BC</td>
<td>The hyp. AC</td>
<td>As radius : co-sine AB :: co-sine BC : co-sine AC (by theorem 2.)</td>
</tr>
<tr>
<td>14</td>
<td>Both legs AB and BC</td>
<td>An angle, suppose A</td>
<td>As fine AB : radius :: tang. BC : tang. A (by theorem 4.)</td>
</tr>
<tr>
<td>15</td>
<td>Both angles A and C</td>
<td>A leg, suppose AB</td>
<td>As fine A : co-sine C :: radius : co-sine AB (by theorem 3.)</td>
</tr>
<tr>
<td>16</td>
<td>Both angles A and C</td>
<td>The hyp. AC</td>
<td>As tan. A : co-tang. C :: radius : co-sine AC (by theorem 4.)</td>
</tr>
</tbody>
</table>

Note. The 10th, 11th, and 12th cases are ambiguous; since it cannot be determined by the data, whether A, B, C, and AC, be greater or less than 90 degrees each.
The Solution of the Cases of oblique spherical Triangles, \(\textit{ibid. n° 4. and 5} \)

<table>
<thead>
<tr>
<th>Case</th>
<th>Given</th>
<th>Sought</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Two sides AC, BC, and an angle A opposite to one of them.</td>
<td>The angle B opposite to the other</td>
<td>As (\text{fine BC} : \text{fine A} :: \text{fine AC} : \text{fine B} ) (by theor. 1.) Note, this case is ambiguous when BC is less than AC, since it cannot be determined from the data whether B be acute or obtuse.</td>
</tr>
<tr>
<td>2</td>
<td>Two sides AC, BC, and an angle A opposite to one of them.</td>
<td>The included angle ACB</td>
<td>Upon AB produced (if need be) let fall the perpendicular CD: then (by theor. 4.) (\text{rad.} : \text{co-fine AC} :: \text{tang. A} : \text{co-tang. ACD} ), but (by theor. 1.) (\text{as tang. BC} : \text{tang. AC} :: \text{co-fine ACD} : \text{co-fine BCD} ). Whence (\text{ACB} = \text{ACD} + \text{BCD} ) is known.</td>
</tr>
<tr>
<td>3</td>
<td>Two sides AC, BC, and an angle opposite to one of them</td>
<td>The other side AB</td>
<td>As (\text{rad.} : \text{co-fine A} :: \text{tang. AC} : \text{tang. AD} ) (by theor. 1.) and (by theor. 2.) as (\text{co-fine AC} : \text{co-fine BC} :: \text{co-fine A} : \text{co-fine BC} ). Note, this and the last case are both ambiguous when the first is so.</td>
</tr>
<tr>
<td>4</td>
<td>Two sides AC, AB, and the included angle A</td>
<td>The other side BC</td>
<td>As (\text{rad.} : \text{co-fine A} :: \text{tang. AC} : \text{tang. AB} ) (by theor. 1.) whence AD is also known: then (by theor. 2.) as (\text{co-fine AD} : \text{co-fine BD} :: \text{co-fine BC} ).</td>
</tr>
<tr>
<td>5</td>
<td>Two sides AC, AB, and the included angle A</td>
<td>Either of the other angles, supposing B</td>
<td>As (\text{rad.} : \text{co-fine A} :: \text{tang. AC} : \text{tang. AD} ) (by theor. 1.) whence BD is also known: then, as (\text{co-fine BCD} :: \text{co-fine A} : \text{co-fine B} ).</td>
</tr>
<tr>
<td>6</td>
<td>Two angles A, ACB, and the side AC betwixt them</td>
<td>The other angle B</td>
<td>As (\text{rad.} : \text{co-fine AB} :: \text{tang. A} : \text{co-tang. ACD} ) (by theor. 4.) whence BCD is also known: then, as (\text{co-fine BCD} :: \text{tang. AC} : \text{tang. BC} ) (by theor. 1.)</td>
</tr>
<tr>
<td>7</td>
<td>Two angles A, ACB, and the side AC betwixt them</td>
<td>Either of the other sides supposing BC</td>
<td>As (\text{rad.} : \text{co-fine AC} :: \text{tang. A} : \text{co-tang. ACD} ) (by theor. 4.) whence BCD is also known: then, as (\text{co-fine BCD} :: \text{tang. AC} : \text{tang. BC} ) (by theor. 1.)</td>
</tr>
<tr>
<td>8</td>
<td>Two angles A, B, and a side AC opposite to one of them</td>
<td>The side BC opposite the other</td>
<td>As (\text{fine B} : \text{fine AC} :: \text{fine A} : \text{fine BC} ) (by theor. 1.)</td>
</tr>
<tr>
<td>9</td>
<td>Two angles A, B, and a side AC opposite to one of them</td>
<td>The side AB betwixt them</td>
<td>As (\text{rad.} : \text{co-fine A} :: \text{tang. AC} : \text{tang. AD} ) (by theor. 1.) and as (\text{as tang. B} :: \text{tang. A} :: \text{fine AD} : \text{fine BD} ) (by theor. 4.) whence AB is also known.</td>
</tr>
<tr>
<td>10</td>
<td>Two angles A, B, and a side AC opposite to one of them</td>
<td>The other angle ACB</td>
<td>As (\text{rad.} : \text{co-fine AC} :: \text{tang. A} : \text{co-tang. ACD} ) (by theor. 4.) and as (\text{co-fine A} : \text{co-fine B} :: \text{tang. BCD} ) (by theor. 3.) whence ACB is also known.</td>
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### TRIGONOMETRY

<table>
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<th>Case</th>
<th>Given</th>
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| 11   | All the three sides AB, AC, and BC | An angle, suppose A | \[
\text{As } \tan \frac{A}{2} \cdot \frac{AB}{BC} : \frac{AC}{AB} = \cot \frac{A}{2} \cdot \frac{AC}{BC} : \frac{AB}{AC} \]
|      |      |        |          |
|      |      |        |          |
| 12   | All the three angles A, B, and ACB | A side, suppose AC | \[
\text{As } \cot \frac{A}{2} : \tan \frac{A}{2} = \cot \frac{A}{2} : \tan \frac{A}{2} \]

**TRINGA**, in ornithology, a genus of birds belonging to the order of grallae. The beak is somewhat cylindrical, and as long as the head; the nostrils are linear; and there are four toes on the feet, the hind one confling of one joint, and elevated above the ground. There are 23 species, principally distinguished by their colour.

**TRINGLE**, in architecture, a name common to several little square members or ornaments, as reglets, pilasters, and plat-bands. It is more particularly used for a little member fixed exactly over every triglyph, under the plat-band of the architrave, from whence the gable or pendant drops hang down.

**TRINIDAD**, or Trinity-island, is situated in the Atlantic or American ocean, between 60° and 63° of west longitude, and between 9° and 11° of north latitude; it is about ninety miles long, and sixty broad.

**TRINIDAD**, a port-town of Mexico, in America, situated in the province of Guatemala, an hundred and twenty miles south-east of the city of Guatemala: W. long. 94°, N. lat. 15°.

**TRINITARIANS**, those who believe in the Trinity; those who do not believe therein, being called antitrinitarians. Trinitarians also denote an order of religious instituted at Rome in the year 1198, under the pontificate of Innocent III. The founders were John de Matha, and Felix de Valois. His holiness gave them permission to establish this order for the deliverance of captives, who groaned under the tyranny of the infidels: he gave them, as a habit, a white gown ornamented with a red and blue cross. After the death of the two founders, pope Honorius III. continued the order, and their rule was approved by his successor Clement IV. in 1267. At first they were not permitted to eat fish, and, when they traveled, were to ride only upon asses. But their rule was corrected and mitigated by the bishop of Paris, and the abbots of St. Victor and St. Genevieve, who allowed them to eat any kind of food, and to use horses. This order possesses about two hundred and fifty convents in thirteen different provinces, six of which are in France, namely, France, Normandy, Picardy, Champagne, Languedoc, and Provence; three in Spain, viz. New Castile, Old Castile, and Aragon; one in Italy, and one in Portugal. There was formerly the province of England, where this order had forty-three houses; that of Scotland, where it had nine; and that of Ireland, where it had fifty-two; besides a great number of monasteries in Saxony, Hungary, Bohemia, and other countries. The convent of Cerfroy in France is head of the order.

**TRINITY**, in theology, the ineffable mystery of three persons in one God; Father, Son, and Holy Spirit.

**TRINITY SUNDAY**, a festival observed on the Sunday next after Whitunday, in honour of the holy Trinity. The observance of this festival was first enjoined in the council of Arles, anno 1260.

**Fraternity of the Trinity**, a religious society instituted at Rome by St. Philip Neri, in 1548. These religious were appointed to take care of the pilgrims who came to visit the tombs of St. Peter and St. Paul. The society originally consisted of only fifteen religious, who assembled on the first Sunday of every month, in the church of St. Saviour del Campo, to hear the exhortations of the founder; after whose death pope Paul IV. gave the fraternity the church of St. Benedict, near which they have since built a large hospital, for the reception of pilgrims. The fraternity is one of the most considerable in Rome, and most of the nobility of both sexes have been members thereof.

**TRIO**, in music, a part of a concert wherein three persons sing; or more properly a musical composition consisting of three parts.

**TRIONES**, in astronomy, a sort of constellation or assemblage of several stars in the uria minor, commonly called Charles's wain.

**TRIOPTERIS**, in botany, a genus of the decandria trigynia...
TRIP, a fea-term. A ship is said to bear her top-sails a- 
trip, when she carries them hoisted up to the highest.

TRIPHTHONG, in grammar, an assemblage or concourse of 
three vowels in the same syllable, as cue.

TRIPLE, in music, is one of the species of measure or 
time. See Music.

TRIPOD, in antiquity, a famed sacred seat or stool, sup-
ported by three feet, whereon the priests and fibyls were 
placed to render oracles. It was in the tripod that the 
gods were said to inspire the Pythians with that divine 
fury and enthusiasm wherewith they were seized at the 
delivery of their predictions.

TRIPOLI, a state of Africa, which including Barca, is 
bounded by the Mediterranean sea on the north, by 
Egypt on the east, by Nubia and Bilgdugerd on the south, 
and by Tunis on the west; extending along the shore of 
the Mediterranean from the north-west to the south-east 
about a thousand miles, but scarce two hundred miles 
broad in any place. The city of Tripoli, being the ca-
scription: E. long. 14° 1/2, N. lat. 33° 30'.

TRIQUETRUS, among botanists, expresses a fruit or leaf 
that has three sides or faces all flat.

TRIJEMIS, in antiquity, a gally with three ranks of oars 
on a side.

TRISMEGISTUS, an epithet or surname given to one of 
the two Hermes, or Mercuries, kings of Thebes in E-
ypt, who is said to be contemporary with Moses.

TRISPASTON, in mechanics, a machine with three pul-
leys, or an assemblage of three pulleys for raising of great 
weights.

TRISYLLABLE, in grammar, a word consisting of three 
syllables.

TRITICUM, in botany, a genus of the triandria digynia 
class. The calix consists of six segments; and there 
are three seeds, with a double membranous wing. There 
is but one species, a native of Jamaica.

TRITON, a sea demi-god, held by the ancients to bean of-
fury and enthufiasms with which they were seized at the 
delivery of their predictions.

TRITON, in zoology, a genus belonging to the order of 
the sea-fish. The victims were slain. In the mean time all 
the temples were open, and all the altars loaded with offer-
ings and incense; games and combat were celebrated in 
the public places, and rejoicings appeared everywhere.

TRIUMPH, in Roman antiquity, a public and solemn ho-

TRIUMPH, was decreed by the Senate to a general, upon 
the conquering of a province, or gaining a signal victory. 
The day appointed for the ceremony being arrived, scath-
folds were erected in the forum and circus, and all the 
other parts of the city, where they could best behold the 
pomp; the Senate went to meet the conqueror without 
the gate called Capena or Triumphalis, and marched back 
in order to the capitol; the ways being cleared and clean-
fed by a number of officers and attendants, who drove away 
such as thronged the passage, or struggled up and down.

The general was clad in a rich purple robe, interwoven 
with figures of gold, setting forth his great exploits; his 
bufkins were befit with pearl; and he wore a crown, 
which at first was only laurel, but afterwards gold; in 
one hand he bore a branch of laurel, and in the other a 
truncheon. He was drawn in a magnificent chariot, ad-
dorned with ivory and plates of gold, drawn usually by 
two white horses; though sometimes by other animals, 
as that of Pompey, when he triumphed over Africa, by 
elephants; that of Marc Antony, by lions; that of He-
liogabalus, by tygers; that of Aurelian, by deer, &c.

His children were at his feet, and sometimes on the cha-
riot-horses. The procession was led up by the musicians, 
who played triumphal pieces, in praise of the general: 
these were followed by young men, who led the victims 
to the sacrifice, with their horns gilded, and their heads 
adorned with ribbands and garlands; next came the carts 
and wagons, loaded with all the spoils taken from the 
enemy, with their horers, chariots, &c. these were fol-
lowed by the kings, princes, and generals, who had been 
taken captives, loaded with chains: after these appeared 
the triumphal chariot, before which, as it passed, they 
all along threw flowers, and the people, with loud ac-
clamations, called out 'Io triumphi!' The chariot was 
followed by the Senate, clad in white robes; and the Sen-
ate by such citizens as had been set at liberty or rans-
fomed: and the procession was closed by the priests and 
their officers and utensils, with a white ox led along for 
the chief victim. In this order they proceeded through 
the triumphal gate, along the via sacra, to the capitol, 
where the victims were slain. In the mean time all the 
temples were open, and all the altars loaded with offer-
ings and incense; games and combat were celebrated in 
the public places, and rejoicings appeared everywhere.

TRIUMVIR, one of three persons who govern absolutely, 
and with equal authority, in a state. It is chiefly applied 
to the Roman government: Caesar, Pompey, and Crassus 
were the first triumvirs, who divided the government am-
ongst them. There were also other officers, called 
triumvirs; as the triumviri or trefviri capiteles, who were 
the keepers of the public goal; they had the office of pu-
nishing malefactors; for which purpose they kept eight 
boys under them.

TRIUMVIRATE, an absolute government, administered 
by three persons with equal authority. See the preced-
ing article.

TROCHANTER, in anatomy. See Anatomy, p. 181.

TROCHE, in pharmacy, a sort of medicine, made of glu-
tinous substances, into little cakes, and afterwards ex-
sected.
TROCHÆUS, in the Greek and Latin poetry, a foot consisting of two syllables, the first long, and the second short.

TROCHILUS, in ornithology, a genus belonging to the order of peregrines. The beak is tubular and thread-shaped, with a tubular apex, and longer than the head, the superior mandible thrusting the inferior; the tongue is thread-shaped; and the feet are fitted for walking. This genus comprehends all the humming birds, which are the smallest of birds, and are distinguished by their colour and the shape of their bills.

TROCHLEA, one of the mechanical powers, usually called a pulley. See Mechanics.

TROCHLEARES, in anatomy. See Anatomy, p. 290.

TROCHLOIDES, in the ancient geography, a people of Ethiopia, said to have lived in caves under ground. Pom. Mela gives a strange account of the Troglodytes: he says, they did not know properly speak as shrieks, and that they lived on serpents.

TROJA, or Trojan games, were games said to be instituted by Ascanius, son of Aeneas, and afterwards kept up by the Romans with great solemnity. They were celebrated by companies of boys, neatly dressed, and furnished with little arms and weapons, who muttered in the public circus. They were chosen, for the most part, out of the noblest families of Rome, and the captain of them had the honourable title of princeps juventutis, being sometimes next heir to the empire, and seldom less than the son of a principal senatus.

TROIS RIVIÈRES, a town of North America, in the province of Canada, situated on the river of St. Laurence, fifty miles south of Quebec; W. long. 75° 6', and N. lat. 46° 45'.

TRONAGE, an ancient customary toll, paid for weighing of wool. This word is particularly mentioned in a charter granted to the mayor and citizens of London; in which city there is an officer called tronator, who has the business of it.

TRONCONNE, in heraldry, denotes a crofs, or other thing, cut in pieces and dismembered, yet so as all the pieces keep up the form of a crofs, though set at a small distance from one another.

TROOP, a small body of horse or dragoons, about fifty or sixty, sometimes more, sometimes less; commanded by a captain. Each troop, besides a captain, has a lieutenant, coronet, quarter-mater, and three corporals, who are the lowest officers of a troop.

TROPEÁOLUM, in botany, a genus of the octandria monogynia class. The calix consists of one calcarated leaf; and the corolla of five unequal petals; and there are three dry berries. The species are three, natives of Peru.

TROPE, in rhetoric, a kind of figure of speech, whereby a word is removed from its first and natural signification, and applied with advantage to another thing, which it does not originally mean; but only stands for it, as it has a relation to or connection with it: as in this sentence, God is my rock. Here the trope lies in the word rock, which being firm and immovable, excites in our minds the notion of God's unfailling power, and the steady support which good men receive from their dependence upon him.

TROPHY, among the ancients, a pile or heap of arms of a vanquished enemy, raised by the conqueror in the most eminent part of the field of battle.

TROPICS, in astronomy. See Astronomy, p. 469.

TROUT, in ichthyology. See Salmo.

TRUSS, a bundle, or certain quantity of hay, drawn, or certain quantity or measure: thus, a tub of tea contains about sixty pounds; thirty-six trusses make a load.

TRUSS is also used for a sort of bandage or ligature, made of flax, or the like matter, wherewith to keep up the parts in those who have hernias or ruptures.

TRUSTEE, one who has an estate, or money, put or committed to another for the use of another.

TRUTH, a term used in opposition to falsehood, and applied to propositions which answer, or accord, to the nature and reality of the thing whereof something is affirmed or denied.

TUB, in commerce, denotes an indeterminate quantity or measure: thus, a tub of tea contains about sixty pounds; a tub of camphor from fifty-six to eighty pounds.

TUBE, in general, pipe, conduit, or canal; a cylinder hollow within, either of lead, iron, wood, glass, or other matter, for the air, or some other fluid, to have a free passage or conveyance through.

TUBERCLE, in botany, a kind of round turgid root, in form of a knob or turnip.

The plants which produce such roots are hence denominated tuberose, or tuberous, plants.

TUBERCLES, among physiicians, denote little tumours which suppurate and discharge pus, and are often found in the lungs, especially of consumptive persons.

TUBIPORA, a genus of sub-marine plants, belonging to the cryptogamia class, of the hardnefs of coral, and consisting of cylindrical tubes rising from a thin crust of the same sort of matter with themfelves.

TUBULI ACTIFIÆRI, in anatomy. See Anatomy, p. 277.

TUCUMAN, the south-west division of the province of La Plata, or Paraguay, in South America.

TULIPA, in botany, a genus of the hexandria monogynia class. The corolla is bell-shaped, and consists of six petals; it has no styli. There are three species, none of them natives of Britain.

TUMEFACIUNT, the act of swelling or rising into a tumour.

TUMOUR, in medicine and surgery, a preternatural rising
**TUN**, a large vessel or cask of an oblong form, biggest in the middle, and diminishing towards its two ends, gilt about with hoops, and used for storing several kinds of merchandise, for convenience of carriage; as brandy, oil, sugar, flins, hats, &c. This word is also used for certain vessels of extraordinary bigness, serving to keep wine in for several years.

Tun is also a certain weight whereby the burden of ships, &c. are esteemed.

**TUNBRIDGE**, a town of Kent, situated thirty-three miles west of Canterbury, much resorted to on account of its excellent waters.

**TUNICA**, a kind of waistcoat, or under garment, in use amongst the Romans. They wore it within doors by itself, and abroad under the gown. The common people could not afford the toga, and so went in their tunics, whence Horace calls them popellus tonicas.

**TUNICA**, in anatomy, is applied to the membranes which invest the vessels, and divers others of the less solid parts of the body; thus the interlines are formed of five tunics, or coats.

**TUNNAGE** is used for a custom or imposition, payable to the chandize, for convenience of carriage; as brandy, oil, with hoops, and used for flowing several kinds of merchandise, for several years.

**TURBO**, in zoology, a genus of insects belonging to the order of vermes testacea. This is an animal of the snail kind; the shell consists of one spiral solid valve; and the aperture is orbicular. There are 49 species, distinguished by peculiarities in their shells.

**TURBO**, in ichthyology. See **PLEURONECTES**.

**TURCICA TERRA, TURK-EARTH**, in the materia medica, a very fine bole or medicinal earth, dug in great plenty in the neighbourhood of Adrianople, and used by the Turks as a sudorific and astringent, and famous among them in pestennial diseases.

**TURCOSE**, in natural history, an ore of copper.

There are, indeed, two kinds of turcois; the one a true and genuine ore of copper; the other the bones of animals tinged to a beautiful blue colour, by having been buried in places where copper-ore has been near them.

**TURCOSIA**, a very extensive empire, comprehending some of the richest countries in Europe, Asia, and Africa.

Turk in Europe, comprehends Romania, Bulgaria, Serbia, Bosnia, Ragusa, Wallachia, Moldavia, Bessarabia, Budzak, Crim, and little Tartary, with Albania, Epirus, Macedonia, Thebaly, and all the ancient Greece, with its numerous islands. See **ROMANIA**, &c.

Turk in Asia, comprehends Napoleon, Diarbeck, Syria. Turcomania, and part of Georgia and Arabia.

And Turk in Africa, comprehends the fruitful and extensive country of Egypt.

**TURMERIC**, in the materia medica, the root of a plant, called by botanists curcuma. See CURCUMA.

**TURNEP**, in botany, a species of brassica. For the culture of them, see **AGRICULTURE**, p. 67.

**TURNER**, in botany, a genus of the pentandria trigynia class. The calyx is funnel-shaped, and consists of five segments; there are five petals inserted into the calyx; the ligums are divided into many parts; and the capsule has one cell. There are three species, none of them natives of Britain.

**TURNING**, a branch of sculpture, being the art of fashioning hard bodies, as brass, ivory, wood, &c. into a round or oval form, in a lathe.
TURPENTINE, a transparent sort of resin, flowing either naturally or by incision from several unctuous and resinous trees, as the terebinth, larch, pine, fir, &c.

The turpentine of Chio or Scio, which is the only genuine kind, and that which gives the denomination to all the rest, is a whitish resin, bordering a little on green, very clear, and a little odoriferous; drawn by incision from a tree called terebinthus, very common in that island, as also in Cyprus, and some parts of France and Spain.

The uses of turpentine in medicine are innumerable. It is a great vulnerary, and very detergent, and as such is prescribed in abscesses, ulcers, &c. It promotes expectoration, and as such is prescribed in diseases of the lungs and breast; but it is most famous for clearing the urinary passages, and as such prescribed in obstructions of the reins, in gonorrhoea, &c.

Oil of Turpentine. There are two kinds of oil drawn from turpentine, by distillation; the first white, the second red, both esteemed as balsams proper for the cure of wounds, chilblains, &c. But they are so little used among us, that it is not easy to procure either of them.

What is commonly sold under the name of oil of turpentine, or etherial oil, is only a distillation of the resinous juice of the tree, fresh as it is gathered. It is used with success in the cure of green wounds, as also by the painters, farriers, &c. To be good, it must be clear and pellucid as water, of a strong penetrating smell, and very inflammable.

TURRITIS, in botany, a genus of the tetradynamia filiquora class. The pod is very long, and angular; the calyx is connivent and ered; and the corolla is ered.

TUSSILAGO, in botany, a genus of the pyngenefia poly-gama superflua class. The receptacle is naked; the pappus is simple; the scales of the calyx are equal, and somewhat membraneous. There are nine species; three of them natives of Britain, viz. the farfara, or common colt's foot; the hybrida, or long-stalked butter-bur; and the petiolaris, or common butter bur.

The common colt's foot is recommended in coughs, and other disorders of the breast and lungs.
VAIRY, in heraldry, expresses a coat, or the bearings of a coat, when charged or chequered with vair: and hence, vairy-cuppy, or vairy-taffy, is a bearing composed of pieces representing the tops of crutches. See Plate CXLVII. fig. 22.

VALE, proper signifies a sheath, or scabbard: and the term vagina is used, in architecture, for the part of a terminus, because resembling a sheath, out of which the flature seems to issue.

VAGINA, in anatomy, a large canal, formed of a robust or strong membrane, and reaching from the external orifice, or os pudendii, in women, to the uterus. See Anatomy.

VAGUM, or PAR VAGUM. See Anatomy. 249.

VAIR, in heraldry, a kind of fur, consisting of divers little pieces, argent, and azure, resembling a Dutch U, or a bell glass. See Plate CXLVII. fig. 21.

VAiry, in heraldry, expresses a coat, or the bearings of a coat, when charged or chequered with vair: and hence, vairy-cuppy, or vairy-taffy, is a bearing composed of pieces representing the tops of crutches. See Plate CXLVII. fig. 22.

VALENCIA, the capital of a province of the same name, in Spain, situated in a fine plain on the river Guadalavia, W. long. 24°, N. lat. 39° 20'.

VALENTINIANS, in church-history, a sect of Christian heretics, who sprung up in the 11th century, and were so called from their leader Valentinus.

The Valentinians were only a branch of the Gnostics, who realized or personified the platonic ideas concerning the deity, whom they called Ploroma, or plenitude. Their syllem was this: the first principle is Bythos, i.e., depth, which remained many ages unknown, having with
it Enroe or thought, and Sige or silence; from these sprang the Nouns, or intelligence, which is the only Ion, equal to, and alone capable of comprehending, the Bythos; the sister of Nouns they called Alethia, or truth: and these constituted the first quaternity of xions, which were the source and original of all the rest: for Nouns and Alethia produced the world and life: and from these two proceeded man and the church. But besides these eight principal xions, there were twenty two more: these formed Sophia, being desirous to arrive at the knowledge of Bythos, gave herself a great deal of unisearch, which created in her Anger and Fear, of which she was born Matter. But the Horos, or bounder, stopt her, preferred her in the pleroma, and reflored her to her perfection. Sophia then produced the Christ and the Holy Spirit, which brought the xions to their last perfection, and made one of them contribute their utmost to form the Saviour. Here Enthyme, or thought, dwelling near the Pleroma, perfected by the Christ, produced every thing that is in the world, by its divers pations. The Christ sent into it the Saviour, accompanied with angels, who delivered it from its pations, without annihilating it; for the self was formed corporeal matter. And in this manner did they romance, concerning God, nature, and the mysteries of the Christian religion.

VALERIANA, in botany, a genus of the triandria monogynia class. It has no calix; the corolla consists of one petal, gibbous at the base, and situate above the fruit. There are 20 species, three of them natives of Europe, viz. the officinalis, or great wild valerian, whose root is alexipharmic, fadorific, and diuretic; the dioica, or harsh valerian; and the locusta, or lamb-lettuce.

VALET, a French term, used as a common name for all domestic men servants, employed in the more servile offices, as grooms, footmen, coachmen, &c.

VALETUDINARY, among medical writers, denotes a person of a weak and sickly constitution, and frequently out of order.

VALID, in law, an appellation given to acts, deeds, transactions, &c. which are clothed with all the formalities requisite to their being put into execution.

VALLADOLID, a city of Old Spain, in Spain, eighty-six miles north-west of Madrid: W. long. 4° 50', and N. lat. 41° 36'.

VALLINGIN, the capital of a county of the same name, in Switzerland, situated near the lake of Neuchattel, twenty five miles north-west of Bern.

VALLISNERIA, in botany, a genus of the dioica diandria class. The spadix both of male and female consists of two segments, and the corolla of three petals; the spadix of the male is covered with floccules; the spadix has one cell, containing many seeds; and there are three styli. There is but one species, a native of Italy.

VALOIS, a duchy of France, situated on the three great rivers, the Seine, the Marne, and the Oise.

VALUE, in commerce, denotes the price or worth of any thing.

VALUED RENT, in Scots law. See Law, Tit. xii. 6.

VALVE, in hydraulics, pneumatics, &c. is a kind of lid, or cover, of a tube or vessel, so contrived as to open one way; but which, the more forcibly it is pressed the other way, the closer it shuts the aperture; so that it either admits the entrance of a fluid into the tube or vessel, and prevents its return; or admits its escape, and prevents its re-entrance.

VALVE, in anatomy, a thin membrane applied on several cavities and vessels of the body, to afford a passage to certain humours going one way, and prevent their reflux towards the place from whence they came.

VAN, a term derived from the French avant, or avanti, signifyng before, or foremost of any thing; thus we say, the van-guard of an army, &c.

VANDALIA, the ancient name of the countries of Mecklenburg and Pomerania, in Germany.

VANELLUS, in ornithology. See Tringa.

VAPOUR, in philosophy, the moist and most volatile particles of bodies, separated by heat, and raised into the atmosphere. See Rain.

VAPOURS, in medicine, a disease properly called hyps, or the hypochondriacal disease, and in men particularly the spleen. See Medicine, p. 148.

VARI, in medicine, little hard and ruddy tumours, which frequently infect the faces of young persons of a hot temperament of body.

VARIATION, in geography and navigation, is the deviation of the magnetic needle, in the mariner's compass, from the true north point, towards either the east or west; or it is an arch of the horizon, intercepted between the meridian of the place of observation and the magnetic meridian. See Navigation.

VARIEGATION, among botanists and florists, the act of streaking or diversifying the leaves, &c. of plants and flowers with several colours.

Variegation is either natural or artificial. Of natural variegation there are four kinds: the first having itself in yellow spots here and there in the leaves of plants called by gardeners the yellow bloach. The second kind, called the white bloach, marks the leaves with a great number of white spots or stripes; the white streak passing the surface of the leaves, usually accompanied with other marks of a greenish white, that lie deeper in the body of the leaves. The third, and most beautiful, is where the leaves are edged with white, being owing to some disorder in the juices, which it has the natural complection or verdure of the plant. The fourth kind is that called the yellow edge.

Artificial variegation is performed by inarching or inoculating a striped or variegated plant into a plain one of the same sort; as a variegated common jessamin into a plain, common, Spanish, Brazil, or Indian jessamin.

A single bud or eye, Mr Bradly observed, being placed in the escutcheon of a diseempered tree, where it can only receive nourishment from the vitiated juices, will become variegated proportionably to the nourishment it draws; and will partake more of the white and yellow juice, than if a branch shall be inarched, the bud having nothing to nourish it but the juices of the plant; it is inoculated on; whereas a cyon inarched is fed by the striped plant, and the healthful one.

As to the natural stripes and variegations, there are some particular circumstances to be observed: 1. That some plants only appear variegated or bloached in the spring and autumn, the stains disapplying as they gather strength: of this kind are rue, thyme, and marjoram. 2. Some plants are continually bloached in the spongy part of their
their leaves, the sap-vessels all the time remaining of a healthful green; which, being strengthened by rich manure, or being inarched in healthful plants, throw off the diltemper. 3. In other plants, the disease is rooted and inveterate, that it is propagated with the feed; such as the arch-angel, water-betony, back-crefs, bor- rage, stripped cellary, and fycamore; the sides of which produce striped plants.

VARIOLE, the small-pox. See Medicine, p. 75.

VARIX, in medicine, the dilatation of a vein, arising from the too great abundance or thickness of the blood.

VARNISH, a thick, viscid, flaming liquor, used by painters, gilders, and various other artificers, to give a glows and lustre to the works; as also to defend them from the weather, dust, &c.

There are several kinds of varnishes in use; as the fictive or dry varnish, of oil of aspin, turpentine, and sandarach melted together. White varnish, called also Venetian varnish, made of oil of turpentine, fine turpentine, and maflic. Spirit of wine varnish, made of sandarach, white amber, gum elemi, and maflic; serving to gild leather, picture-frames, &c. withal.

1. To make the white varnish: take gum sandarach, of the clearest and whiteft fort, eight ounces; gum maflic, of the clearest fort, half an ounce; of farcocolla, the whiteft, three quarters of an ounce; Venice turpentine, an ounce and a half; benzoin, the cleareft, one quarter of an ounce; white rosin, one quarter of an ounce; gum animae, three quarters of an ounce; let all thefe be difolved, and mixed in the manner following:

Put the farcocolla and rofin into a little more spirit, than will cover them to difolve; then add the benzoin, gum animae, and venice-turpentine, into either a glafs or glazed earthen vessel, and pour on as much spirit as will cover them an inch; then put the gum maflic into a glafs or glazed veffel, and pour strong spirit upon it, covering it alfo about an inch thick, to difolve it rightly; then put your gum elemi into a distinct veffel as before, and cover it with spirits to difolve.

For this purpofe, you need only break the rofin a little, and powder the gum animae, farcocolla, and benzoin.

Let all fland three or four days to difolve, shaking the glasses, &c. two or three times a day, and afterwards put them all together into a glazed veffel, stirring them well, and strain the liquor and gums gently, beginning with the gums, through a linen cloth.

Then put it into a bottle, and let it fland a week before you ufe it, and pour off as much of the clear only, as you think sufficient for present ufe.

A hard varnish that will bear the muffle may be thus made: Take of colophony, an ounce; let it over the fire in a well-glazed earthen vessel, till it is melted; then by little and little, flrew in two ounces of powder of amber, keeping it flirring all the while with a flift; and when you perceive it begin to harden or reft the flift, then put in a little turpentine oil, which will thin and soften it immediately; then put in two ounces of gum copal, finely powdered, sprinkling it in as you did the amber, now and then pouring in a little oil of turpentine; and when it is done, flain it as before directed.

This is proper to varnish over gold; and the things done with it must be set into a declining oven, three or four days successively, and then it will refit even the fire itself.

To make a varnish for gold, or metals made in imitation of gold. Take colophony, and, having melted it, put in two ounces of amber finely powdered, and some spirit of turpentine; and, as the amber thickens, keep it well flirring; then put in an ounce of gum elemi, well pulverized, and more spirit of turpentine; contantly flirring the liquor till all is well mixed and incorporated; but take care, however, to use as little turpentine as you can, because the thicker the varnish is made, the harder it will be. Let this be done over a fand-heat, in an open-glafs; then flain it, as is directed for the preceding varnish. This varnish is to be ufed alone, first warming the veffels made of paper paffe; and lay it on with a painting-brush before the fire, but not too near. Left the fire raife it into blifters. After this has been done, har- den it three several times in ovens; first with a fack heat, the next with a warmer, and the third with a very hot one; and the veffels will look like polished gold.

And as for fuch veffels, &c. as shall be made with faw dust and gums, the varnish may be made of the fame ingredients as above-mentioned, except the gum elemi, and this will dry in the fun, or in a gentle warmth.

To make a varnish for any thing covered with leaf-filver. First paint the thing over with fize, and ground chalk or whitening; let them fland till they are thoroughly dry, and then do them over with very good gold-size of a bright colour (for there is much difference in the colour of it, fome being yellow, and others almoft white; the firt is moft proper for gold, and the laft for silver. When this size is fo dry as that it will juft fllick a little to the touch, lay on the leaf-filver, and clofe it well to the fize.

To make a varnish for silver. Melt, in a well-glazed pipkin, fome fine turpentine, and put in three ounces of white amber finely powdered (more or lefs, according to the quantity your work requires;) put it in by little and little, keeping it continually flirring, adding by de- grees some spirit of turpentine, till all the amber is dif- solved; and then add to it an ounce of farcocolla well beaten, and an ounce of gum elemi well levigated, adding now and then a little spirit of turpentine, till all is dif- solved: do this over a gentle fire, and keep it continually flirring.

This varnish will be as white and ftrong as the former; and is to be ufed warm, and hardened by degrees in an oven, as varnished gold, whereby it will look like polished silver.

Laying on of Varnishes. 1. If you varnish wood, let your wood be very smooth, clofe, grained, free from greafe, and rubbed with rufhes. 2. Lay on your colours as smooth as poiffible; and, if the varnish has any blifters in it, take them off by a polifh with rufhes. 3. While you are varnifhing, keep your work warm, but not too hot. 4. In laying on your varnish, begin in the middle, and froke the brufh to the outifide; then to another ex- treme part, and fo on till all be covered: for if you be- gin at the edges, the brufh will leave blots there, and make the work unequal. 5. In fine works ufe the fift tripoli in polifhing: do not polifh it at one time only; but after the firft time, let it dry for two or three days, and polifh it again for the laft time. 6. In the firft polifhing, you muft ufe a good deal of tripoli; but in the next a very little.
little will serve: when you have done, wash off your tri-
poli with a sponge and water: dry the varnish with a dry
linen rag; and clear the work, if a white ground, with
oil and whitew; or, if black, with oil and lamp-black.

Varnish also signifies a sort of shining coat, wherewith
potter's ware, delf ware, china ware, &c. are covered,
giving them a smoothness and lustre. Melted lead is generally used for the first, and sight for the second.

Varnish, among medallists, signifies the colours antique
medals have acquired in the earth.

The beauty which nature alone is able to give to me-
cals, and art has never attained to counterfeit, en-
ances the value of them; that is, the colour, which cer-
tain fails, in which they have a long time lain, tinges the
metal or fpirit: fome of which are blue, almoft as
beautiful as the turquoifie; others with an inimitable ver-
milion colour; others with a certain shining polished
brown, vially finer than brafil figures.

The most usual varnish is a beautiful green, which
hangs to the finest strokes without effacing them, more ac-
curately than the finest enamel does on metals.

No metal but brass is susceptible of this; for the green
ruff that gathers on silver always foils it, and it must be
got off with vinegar or lemon-juice.

Plafters of medals have a fable or modern varnish,
which they use on their counterfeit, to give them the
appearance, or air, of being antique. But this may be
discovered by its softnefs, it being softer than the natu-
ral varnish, which is as hard as the metal itself.

Some deposit their fpiruous metals in the earth for a
considerable time, by which means they contract a fort
of varnish, which may impofe upon the lefs knowing; o-
thers ufe falf armoniac, and others burnt paper.

VASE, a vefsel either for mechanical, chemical, culinary, or
any other ufe. In anatomy, all the parts which con-
vey a fluid are called vefsels, as the veins, arteries, and
lymphatics.

VASCULAR, something confifling of divers vefsels; as
arteries, veins, nerves, &c.

VASCULIFEROUS plants, fuch whose feds are con-
tained in vefsels, which are fometimes divided into cells.

VASE, a term frequently ufed for ancient vefsels dug from
under ground, orotherwise found, and preferred in the
cabinets of the curious.

In architecture, the appellation vafe is alfo given to
certain ornaments placed on corniches, fofticles, or pedes-
tals, representing the vefsels of the ancients, particularly
thofe ufed in facrifice: as incife-pots, flower-pots,

VASSAL, denotes a tenant that holds land in fee of his lord.

VASSAL, in Scots law. See Law, Tit. x. 3.

VASTUS, in anatomy. See Anatomy, p 207.

VATERIA, in botany, a genus of the polyandria mono-
gynia clafs. The corolla confifts of five petals, and the
calix of five fegments; the fapule has three valves, and
one cell containing three feds. There is but one spe-
cies, a native of India.

VATICAN, a magnificent palace of the pope, in Rome,
which is laid to confift of feveral thousand rooms; but
the parts of it molt admired are the grand hair-cafle, the
pope's aj[artment; and especially the library, which is
one of the richest in the world, both in printed books
and manuscripts.

VAUDEMONT, the capital of a county of the fame name
in Lorrain, fifteen miles south-west of Nancy.

VAUDOS, are certain valleys situated north of the mar-
quifate of Saluzzo, in Italy: the chief town is Lucerne.

VAULT, in architecture, an arched roof, fo contrived
that the fones which form it fustain each other.

Vaults are, on many occasions, to be preferred to flats
or flat ceilings, as they give a greater height and ele-
vation, and are besides more firm and durable.

VAUR, a town of Languedoc, in France, eighteen miles
west of Toulouse.

UBEDA, a city of Andalufia, in Spain, forty-five miles
north east of Granada: W. long. 3° 6', N. lat. 38°.

UBERLINGEN, a town of Swabia, in Germany, ten
miles north of Conflance.

UBES, or St. Ubes, a city and port-town of Portugal,
situated on a fine bay, twenty-one miles south of Lisbon.

UBQUITARIANS, in church-hifory, a fedl of heretics
who sprung up in Germany about the year 1590, and
maintained that the body of Jefus Chrift is ubique, every-
where, or in every place, at the fame time. However,
they were not quite agreed among themselves; fome hold-
ing, that the body of Jefus Chrift, even during his mor-
tal life, was every where; and others dating the ubiquity
of his body from the time of his afcenfion only

UBIQUITY, omniprefence: an attribute of the Deity,
whereby he is always intimately prefent to all things.

UDDER, that part in brutes wherein the milk is prepared;
answering to the mamme, or breasts, in women.

VECTOR, in aeronautics, a line fuppofed to be drawn from
any planet moving round a centre, or the focus of an el-
liphs, to that centre or focus.

VEDETTE, in the military art, a sentinel on horseback,
detached from the main body of the army to discover
and give notice of the enemy's deigns.

VEER, a fea term varioufly ufed. Thus veering out a
rope, denotes the letting it go by hand, or letting it run
out of itfelf. It is not ufed for letting out any running
rope except the fheet.

VEER is alfo ufed in reference to the wind; for, when it
changes often, they fay it veers about.

VEGETABLE, a term applied to all plants. confeidered as
capable of growth; i.e. all natural bodies which have
parts organically formed for accretion, but not fenfation.

VEGETATION, the act whereby plants receive nourish-
ment, and grow. See Agriculture, p. 40.

VEGETATIVE SOUL, among philofophers, denotes that
principle in plants, by virtue of which they vegetate, or
receive nourishment and grow.

VEHICLE, in general, denotes any thing that carries or
receives the body of Jefus Chrift is ubique, every-
where, or in every place, at the fame time. However,
they were not quite agreed among themselves; fome hold-
ing, that the body of Jefus Chrift, even during his mor-
tal life, was every where; and others dating the ubiquity
of his body from the time of his afcenfion only

VEIL, a piece of fuff, ferving to cover or hide any thing.

The Veil, in Roman churches, in time of Lent, they have veils or curtains over the altar, crucifix, images of faints, &c.

A veil or crapes is wore on the head by nuns, as a badge
of their profeflion: as incife-pots, flower-pots,

VEIN, in anatomy. See Anatomy, p. 207.

VEIN, among miners, is that space which is bounded with
waghs, and contains ore, spars, canck, clay, chert, stoll,
brownhe.
VENIAL, in the Romifh theology, a term applied to flight faults, and fuch as eafily obtain pardon.

VELEN, in botany, a genus of the diandria monogyia class. The corolla is funnel-shaped, and crooked; the caix is truncated; and it has two or more equal; and the capfule has two eels, and two valves. There are three fpecies, none of them natives of Britain.

VERA cruz, a port-town of Mexico, fituated on the South Sea, wellward of the gulf of Panama.

VERS, in grammar. See Grammar, p 734.

VERBAL Agreement, in Scots law. See Law, Tit. xxi. 1. &c.

VERBASCUM, in botany, a genus of the pantandria monogyia clafs. The corolla is rotated, and somewhat unequal; and the capfule has two cells, and two valves. There are twelve fpecies, four of them natives of Britain, viz. the thapsus, or great white mullein, the leaves of which are emollient; the lychnitis, or hoary mullein; the nigrum, or black mullein; and the blattoria, or yellow moth-mullein.

VERBENA; in botany, a genus of the diandria monogyia clafs. The corolla is funnel-shaped, and crooked; one tooth of the calyx is truncated; and it has two or four...
four naked seeds. There are 16 species, only one of them, viz. the officinalis, or vervain, a native of Britain.

VERBERATION, in physics, a term used to express the cause of sound, which arises from a vibration of the air, when struck in divers manners by the several parts of the resonant body first put into a vibratory motion.

VERBESINA, in botany, a genus of the Syngenesia polygamia superficula class. The receptacle is paleaceous; the pappus is furnished with an awn; the calyx is double; and it has about five floccules in the radius. There are 13 species, none of them natives of Britain.

VERD, or Cape-verd, a promontory of Africa, forty miles north-west of the mouth of the river Gambia: W. long. 18°, N. lat. 15°. There are a number of islands in the Atlantic ocean, called Cape-Verd islands, from their being situated off this cape.

VERDIGREASE, a kind of rust of copper, much used by painters as a green colour.

Verdigrease is properly no other than copper dissolved by a mild acid into the form of an ærugo, or rust.

This rust of copper is rarely used internally; nor ought it, unless in the most desperate cases, where instantaneous vomiting is necessary. Externally it is much used as a detergent or defcriptive: it eats off fungous flesh in ulcers, and, mixed with honey, is used in aphæs and ulcerations of the mouth.

VERDICT, is the answer of the jury given to the court, concerning the matter of fact, in any civil or criminal, committed by the court to their trial and examination.

VERDITER, or Verditer, a kind of mineral substance, sometimes used by the painters, &c. for a blue; but more usually mixed with a yellow for a green colour.

VERDOY, in heraldry, denotes a bordure of a coat of arms, charged with any kinds or parts of flowers, fruits, feeds, plants, &c.

VERGETTE, in heraldry, denotes a pallet, or small pale; and hence, a shield divided by such pallets is termed vergette. See Pale.

VERSION, a translation of some book or writing, out of one language into another.

VERSATION, the art or manner of making verse; also the tune and cadence of verse.

Verfication is properly applied to what the poet does in great esteem among the ancients, under the name of minium. There are two kinds of it, the one natural, the other factitious. The natural is found in some silver mines, in the form of a ruddy sand, which is afterwards prepared and purified by several lotions and coacations. The artificial is made of mineral cinnebar, ground up with aqua-vitae and urine, and afterwards dried.

It is also made of lead burnt and washed, or of a cerufs prepared by fire: but this is not properly called vermillion, but minium, or red-lead.

VERMIN, a collective name including all kinds of little animals, or insects, which are hurtful or troublesome to men, beasts, fruits, &c. as worms, lice, fleas, caterpillars, ants, flies, &c.

VERNAL, something belonging to the spring season.

VERONA, a city of Italy, in the territory of Venice, capital of the Veronesse, situated on the Adige: E. long. 11° 15', N. lat. 45° 20'.

VERNACULAR, is applied to any thing that is peculiar to some one country.

VERSO, in poetry, a line or part of a discourse, consisting of a number of long and short syllables, which run with an agreeable cadence, the like being also reiterated in the course of the piece.

Verse is also used for a part of a chapter, section, or paragraph, subdivided into several little articles.

VERSIFICATION, the art or manner of making verse; also the tune and cadence of verse.

Verification is properly applied to what the poet does more by labour, art, and rule, than by invention.

VERSION, a translation of some book or writing, out of one language into another.

VERT, in heraldry, the term for a green colour. It is called vert in the blazon of the coats of all under the degree of nobles; but in coats of nobility, it is called emerald; and in coats of kings, venus. In engraving, it is expressed by diagonals, or lines drawn athwart from right to left, from the dexter chief corner to the sinister base, as represented in Plate CXLVII. fig. 23.

VERTEBRAL in anatomy. See Anatomy, p. 166.

VERTEX, in anatomy, denotes the crown of the head.

Hence vertex is also used figuratively, for the top of other things; thus, the vertex of a cone, pyramid, &c. is the top of any one of these figures.

Vertex is also used in astronomy, for the point of heaven perpendicularly over our heads, properly called the zenith.

VERMICILLATE PLANTS. See Botany p. 637.

VERTICITY, is that property of the loadstone, whereby it turns, or directs itself to some peculiar point.

VETIGO, in medicine. See Medicine, p. 146.

VERVAIN, in botany. See Verbena.


VESICA,
VESICA, in anatomy. See Anatomy, p. 269.

VESICATORIUM, an external medicine, serving to raise a blister; whence alo it is itself, though improperly, called a blister.

We have vesicatories made of cantharides, euphorbium, fogs, sublimate of mercury, lapis infernalis, mustard, anacardium, iquivs, bronze, vinegar, pepper, leaven, &c.

VESICULA, a diminutive of vesica, signifying a little bladder.

VESPERTILIONUM, an alias, in anatomy. See Anatomy, p. 269.

VESPERTILIO, the bat, in zoology, a genus of quarads belonging to the order of primates. All the three teeth are erect, pointed, near each other, and the first four are equal; the fore-feet have the toes connected by a membrane expanded into a kind of wings, by which the creature is enabled to fly. They fly about in the night, and feed upon moths.

VESPERTILIONUM ALÆ, in anatomy. See Anatomy, p. 275.

VESSEL, denotes in general any thing for holding liquors; such are our domestic cups, pots, &c. as also the retorts, matresses, crucibles, &c. For the theory and construction of chemical vessels, see Chemistry, p. 108.

In anatomy, all the parts which contain or convey a fluid are called vesicles; as the veins, arteries, lymphatics.

VESSEL, in navigation, a general name for all sorts of ships. See Ship.

VESTALIA, in Roman antiquity, a festival celebrated in honour of the goddess Vesta, on the fifth of the ides of June; that is, on the ninth of that month.

VESTALS, among the ancient Romans, were priestesses of the goddess Vesta, and had the perpetual fire committed to their charge: they were at first only four in number, but afterwards increased to six; and it does not appear that their number ever exceeded six, among whom one was superior to the rest, and called veftalis maxima.

The vestals were chosen from six to ten years of age, and obliged to strict continuance for thirty years; the first ten of which were employed in learning the ceremonies of religion, the next ten in the performance of them, and the last ten in teaching them to the younger vestals.

The habit of the vestals consisted of a head-dress, called infula, which fast close to their heads, and from whence hung certain laces called vitæ; a kind of surplice made of white linen, and over it a purple mantle with a long train to it.

VESTIBLE, in architecture, a kind of entrance into a large building; being an open place before the hall, or at the bottom of the stair-case.

VESTIBLE of the car, in anatomy. See Anatomy, p. 297.

VESTRY, a place adjoining to a church, where the vestments of the minister are kept; and also a meeting at such place, confessing of the minister, church-wardens, and chief men of most parishes, who make a parish vestry or meeting.

By custom there are select vestries, being a certain number of persons chosen to have the government of the parish, make rates, and take the accounts of church-wardens, &c.

VESUVIUS, a famous volcano, or burning mountain, situated only six miles east of the city of Naples, in Italy. See Volcano.

ETCH, in botany. See Vicia.

VETERAN, among the ancient Romans, an appellation given to a soldier who was grown old in the service, or had made a certain number of campaigns.

VIALES, in mythology, a name given among the Romans to the gods who had the care and guard of the roads and high-ways.

VIATICUM, in the church of Rome, an appellation given to the eucharist when administered to persons at the point of death.

VIATOR, in Roman antiquity, an appellation given in common to all officers of any of the magistrates; as lifters, ascenfi, scribes, criers, &c.

VIBE, is sometimes used, by physicians, for a black and blue spot in the skin, occasioned by an afflux or extravasation of blood.

VIBRATION, in mechanics, a regular, reciprocal motion of a body, as a pendulum, &c.

VIBURNUM, in botany, a genus of the pentandria tri-gynia class. The calix is above the fruit, and consists of five segments; the corolla has likewise five segments, and the berry contains one seed. There are nine species, two of them natives of Britain, viz. the lanata, or way-faring tree; and the opulus, or waterelder.

VICAR, a person appointed, as deputy to another, to perform his functions in his absence, and under his authority. A vicar in the canon law, denotes a priest of a parish, the preadial tithes whereof are impropriated or appropriated; that is, belong either to a chapter, religious house, &c. or to a layman, who receives them, and only allows the vicar the small tithes, or a convenient salary.

VICE, in ethics, is ordinarily defined an elective habit, deviating, either in excess, or defect, from the just medium wherein virtue is placed.

Vice, in fhipbery, and other arts employed in metals, is a machine, or instrument, serving to hold fast any thing they are at work upon, whether it is to be filed, bent, rivetted, &c.

Vice is also used, in the composition of divers words, to denote the relation of something that comes instead, or in the place, of another; as vice-admiral, vice-chancellor, vice chamberlain, vice-president, &c. are officers who take place in the absence of admirals, &c.

VICE-ROY, a governor of a kingdom, who commands in the name and stead of a king, with full and sovereign authority. See King.

VICIA, in botany, a genus of the diadelphia decandria class. The under side of the stigma is transversely bearded. There are 18 species, six of them natives of Britain, viz. the acacia, or tufted wood-vetch; the feptum, or bush-vetch; the fativa, or common vetch; the lathyroids, or wild-vetch; and the lutea, or yellow vetch.

VICISSITUDE, the regular succession of one thing after another; as the vicissitude of day and night, of the seasons.

VISCOUNT, a degree of nobility next below a count, or earl, and above a baron.

VICTIM, denotes a bloody sacrifice, offered to some deity,
VINCENT, is also a province of Brazil, bounded by the
River Jamiro on the north, by the Atlantic on the east,
by the province of del Rey on the south, and by that
of the Spanish La Plata on the west.
VINDEMATING, the gathering of the grapes, or other
ripe fruits, as apples, pears, cherries, &c.
VINDEMATRUX, or Vindemator, a fixed star of
the third magnitude in the constellation virgo.
VINE See Vitis.
VINEGAR, an acid penetrating liquor, prepared from
wine, cyder, beer, &c. of considerable use both as a
medicine and furnace. See Chemistry, p. 97, 166.
VINEYARD, a plantation of vines.
The best situation of a vineyard is on the declivity of
an hill, lying on the south.
VINOUS, something that relates to wine, or that has the
taste and smell thereof. See Wine.
VINTAGE, a crop of wine, or what is got from the vines
each season.
VINUM, a liquor or drink commonly called wine. See
Wine.
VIOL, a musical instrument of the same form with the
viol, and struck like that with a bow.
VIOLA, in botany, a genus of the syngenesia monogynia
class. It has two erect follicles; the seeds are plumose;
the calyx consists of five leaves, and the corolla of
five irregular petals horned behind; the capsule has
three valves, and one cell. There are 24 species, of
them natives of Britain.
VIOLACEOUS, something that relates to wine, or that has the
sense it stands opposed to spontaneous.
VIOLACEOUS, in botany, a genus of the syngenesia monogynia
class. It has two erect follicles; the seeds are plumose;
the calyx consists of five leaves, and the corolla of
five irregular petals horned behind; the capsule has
three valves, and one cell. There are 24 species, of
them natives of Britain.
VIOLATION, the act of violating, that is, forcing a
woman, or committing a rape upon her.
This term is also used in a moral sense, for a breach or
infringement of a law, ordinance, or the like.
VIOLIN, a musical instrument of the same form with the
viol, and played like that with a bow.
VIOLONCELLO, of the Italians is properly our fifth vi-
olin, which is a double bass-violin, almost twice as big
as the common bass-violin, and its strings just half as thick and half
as long, which renders the sound just an octave higher
than the same.
VIOLONE, in music, a double bass, almost twice as big
as the common bass-violin, and the strings bigger and
longer in proportion, and consequently its sound an octa-
tave lower than that of our bass-violin, which has a no-
table effect in great concerts.
VIPER, in zoology. See Viper.
VIPERINE, a woman of extraordinary stature and courage;
and who, with the female sex, has the man and air of a
man, and performs the actions and exercises of men.
VIÑA de CRUZ, a double bass, almost twice as big
as the common bass-violin, and the strings bigger and
longer in proportion, and consequently its sound an octa-
tave lower than that of our bass-violin, which has a no-
table effect in great concerts.
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table effect in great concerts.
VIPER, in zoology. See Viper.
VIPERINE, a woman of extraordinary stature and courage;
and who, with the female sex, has the man and air of a
man, and performs the actions and exercises of men.
VIRTUAL, or Potential, something that has a power.

VIRILE, something that belongs or is peculiar to a man.

VIRGO, in astronomy, one of the signs or constellations of the zodiac. See Astronomy, p. 487.

VIRILE, something that belongs or is peculiar to a man, or the male sex.

VIRTUAL, or Potential, something that has a power or virtue of acting or doing. The term is chiefly understood in various significations. In the general it denotes power, or perfection of any thing, whether natural or supernatural, animate or inanimate, essential or accidental. But in its more proper or retracted sense, virtue signifies an habit, which improves and perfects the possessor and his actions.

VIRILISTIC, an Italian term, lately introduced into English, signifying a man of curiosity and learning, or one who loves and promotes the arts and sciences: but among us the term seems to be appropriated to those who apply themselves to some curious and quaint, rather than immediately useful, art or study, as antiquaries, collectors of rarities of any kind, microscopical observers, &c.

VIRULENT, a term applied to any thing that yields a virus, that is, a contagious or malignant pus.

VISCERA, in anatomy, a term signifying the same with entrails, including the heart, liver, lungs, spleen, intestines, and other inward parts of the body. See Anatomy, Part VI.

VISCIDITY, or Viscosity, the quality of something that is viscous or vicious, that is, glutinous and sticky, like bird-lime, which the Latins call by the same viscus.

VISCUM, in botany, a genus of the dioecia tetrandria class. The corolla consists of six segments, and the calyx of five teeth; and the berry contains four seeds.

Vissiers, or Vasters, called visiers-azem, that is, grand vizier, is the prime minister of the whole empire. He commands the army in chief, and presides in the divan or great council. Whereof there are two kinds; the first, called by the name viziers; the intermediate ones being shorter, and more than three grains; and the claws are exerted. There are six species, viz. 1. The ichneumon, with the tail tapering towards the point, and the toes distantly from each other.

VISION, in optics, the act of seeing or perceiving external objects, by means of the organ of sight, the eye. See Anatomy, p. 289. and Optics.

VISULA, or Weisel, a large river of Poland, which, taking its rise in the mountains south of Silesia, visits Cracow, Warsaw, &c. and continuing its course north, falls into the Baltic sea below Danzig.

VISUAL, in general, something belonging to vision.

VITAL, in physiology, an appellation given to whatever ministers principally to the constituting or maintaining of life in the bodies of animals: thus, the heart, lungs, and brain are called vital parts; and those operations of these parts, whereby the life of animals is maintained, are called vital functions.

VITEX, in botany, a genus of the didynamia angiosperma class. The corolla consists of six segments, and the calyx of five teeth; and the berry contains four seeds.

VITICUS, in botany, a genus of the dioecia tetrandria class. See Anatomy, p. 289. and Optics.

VITREOUS Humor of the Eye. See Anatomy, p. 289.

VITRIFICATION, in chemistry, is the converting a body into glass, by means of fire.

VITRIOL, a compound body formed of the particles of metals dissolved by the acid of sulphur, and that either by the operations of nature within the earth, or in the chemists laboratory by proper admixtures and affinities, and afterwards, by the help of water, brought into the form of a salt. See Chemistry, p. 81, 152.

VITRIOLATED, among chemists, something that has vitriol infused in it.

VITRIOLIC, an appellation given to whatever abounds with; or partsake of, the nature of vitriol; thus fuch fossil bodies as contain vitriol, are called vitriolic minerals, or ores of vitriol.

VITTA, in anatomy, that part of the amnios which sticks to the order of serre. They have six fore-teeth, the intermediate ones being shorter, and more than three grains; and the claws are exerted. There are six species, viz. 1. The ichneumon, with the tail tapering towards the point, and the toes distantly from each other.

VIVIPAROUS, in natural history, an epithet applied to such animals as bring forth their young alive and perfect, in contradistinction to them that lay eggs, which are called oviparous animals.

VIVAN,
UKRAIN, a province of Muscovy, lying northwards of Little Tartary, so called as being a frontier against Turkey.

ULADISLAW, a city of Great Poland, situated on the river Borisithenes, eighty-miles north-west of Warlaw: E. long. 19°, and N. lat. 53°.

ULCER, in surgery. See Surgery, p. 646.

ULCERATION, in surgery, a little hole in the skin, caused by an ulcer.

ULEX, in botany, a genus of the diadelphus deciduaria class. The calyx consists of two leaves; and the pod is about the length of the calyx. There are two species, one of them, viz. the europeus, or furze, a native of Britain.

ULGINOUS, in agriculture, an appellation given to a moist, marshy, and feney soil.

ULLAGE, in gauging, is so much of a cask or other vessel, as it wants of being full.

ULM, an imperial city of Swabia, in Germany, ninety miles south-west of Ratibon: E. long. 109°, N. lat. 43° 24'.

ULMORIA, in botany. See Filipendula.

ULMUS, in botany, a genus of the pentandria digynia class. The calyx consists of five segments; it has no corolla; and the berry is dry, compressed, and membranaceous. There are three species, two of them natives of Britain, viz. the campesfris, or common elm; and the glabra, or broad-leaved elm.

ULNA, in anatomy. See Anatomy, p. 178.

ULNARIS, in anatomy. See Anatomy, p. 199.

ULSTER, the most northern province of Ireland, the chief town of which is Londonderry.

ULTERIOR, in geography, is applied to some part of a country or province, which, with regard to the rest of that country, is situated on the farther side of the river, mountain, or other boundary, which divides the country into two parts.

ULTIMUS HÆRES, in Scots law. See Law, Tit. xxix.

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UGC NIA, in general, a Latin term denoting the twelfth part of any thing; particularly the twelfth part of a pound, called in English an ounce; or the twelfth part of a foot, called an inch.

UNCTION, the act of anointing or rubbing with oil or other fatty matter.

UNCTION, in matters of religion, is used for the character conferred on sacred things, by anointing them with oil. Anointings were very frequent among the Hebrews. They anointed both their kings and high-priests at the ceremony of their inauguration. They also anointed the sacred vessels of the tabernacle and temple, to sanctify and consecrate them to the service of God. The anointing of kings is supposed to be a ceremony introduced very late among the Christian princes. It is said, that none of the emperors were ever anointed before Justinian, or Justin. The emperors of Germany took the practice from those of the eastern empire: king Pepin of France was the first who received the anointing. In the ancient Christian church, anointment always accompanied the ceremonies of baptism and confirmation. Extreme anointing, or the anointing persons in the article of death, was also practised by the ancient Christians, in compliance with the precept of St James, chap. v. 14. and 15 verses; and this extreme anointment the Romish church has advanced to the dignity of a sacrament. It is administered to none but such as are afflicted with some mortal disease, or are in a decrepit age. It is refused to impenitent persons, as also to criminals. The parts to be anointed are the eyes, the ears, the nostrils, the mouth, the hands, the feet, and the reins. The laity are anointed in the palms of the hands, but priests on the back of it; because the palms of their hands have been already consecrated by ordination. The parts above-mentioned are anointed in the form of a cross. The priest begins anointing the sick person's eyes, saying, ' May God, by his holy anointing, pardon you the sins you have committed by the eyes.' In like manner he proceeds to the other parts, varying the words according to the parts he anoints.

UNDECEMVIR, a magistrate among the ancient Athenians, who had ten other colleagues or associates joined with him in the same commission. The function of the undecemvir at Athens were much the same as those of the prævots de marcscheuffe in France: they took care of the apprehending of criminals, secured them in the hands of justice, and when they were condemned, took them again into custody, that the sentence might be executed on them. They were chosen by the tribes, each tribe naming its own; and as the number of the tribes after Callithenes was but ten, which made ten members, a scribe or notary was added, which made the number eleven.

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UNDER the sea, in the sea-language. A ship is said to be so when she lies still, or waits for some other ships, with her helm luffed, or tied up a lee.

UNDERSTANDING. See Metaphysics, and Logic.

UNDERWALD, a canton of Switzerland, bounded by the Switz and Lucern on the north, by Uri on the east, and by another part of Lucern on the west; being about 25 miles long, and as many broad.

UNDERWOOD, is coppice, or any wood that is not accounted timber.
UNDULATION, in physics, a kind of tremulous motion or vibration observable in a liquid, whereby it alternately rises and falls like the waves of the sea.

This undulatory motion, if the liquid be smooth and at rest, is propagated in concentric circles, as most people have observed upon throwing a stone or other matter upon the surface of a flagrant water, or even upon touching the surface of the water lightly with the finger or the like. The reason of these circular undulations is, that by touching the surface with your finger, there is produced a depression of the water in the place of contact. By this depression the subjacent parts are moved successively out of their place, and the other adjacent parts thrust upwards, which lying successively on the descending liquid, follow it; and thus the parts of the liquid are alternately raised and depressed, and that circularly. When a stone is thrown into the liquid, the reciprocal vibrations are more conspicuous.

Undulatory motion is likewise applied to a motion in the air, whereby its parts are agitated after the like manner as waves in the sea; as is supposed to be the case when the string of a musical instrument is struck. This undulatory motion of the air, is supposed the matter or cause of ultrasound.

UNDULATORY, in medicine and surgery, a topical remedy or composition, chiefly used in the dressing of wounds and ulcers.

UNGUIS, in anatomy. See Anatomy, p. 150.

UNION, a junction, coalition, or assemblage of two or more different things in one.

UNION OF LANDS, in Scots law. See Law, Tit x. 20.

UNION, or the Union, by way of eminence, is more particularly used to express the act whereby the two separate kingdoms of England and Scotland were incorporated into one, under the title of The Kingdom of Great-Britain. This happy union, in vain attempted by king James I. was at length effected in the year 1707, by the general consent of the queen and the élites of each realm. The chief articles of this union are, That the two kingdoms shall be united into one kingdom, by the name of Great-Britain; that they, in consequence thereof, be represented by one parliament, of which sixteen peers and forty-five commoners are to be elected for Scotland, and have the same privileges with those of England; that the subjects of either nation shall have equal freedom of trade, and be liable to the same customs, and the like laws for public government, &c. The kirk or church of Scotland is confirmed; and the courts of justice are to remain the same as they were before the union, yet subject to regulation, &c. A court of exchequer is also erected in Scotland, to be a court of record, revenue, and judicature; for ever; and barons of the said court are appointed, who shall be the judges there.

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VOCABULARY, in grammar, denotes the collection of the words of a language, with their significations, otherwise called a dictionary, lexicon, or nomenclature. See Dictionary.

A vocabulary is properly a larger kind of dictionary, which does not enter so minutely into the origins and different acceptations of words.

VOCAL, something that relates to the voice or speech: thus vocal music is that set to words, especially verses, and to be performed by the voice; in contradistinction to instrumental music, composed only for instruments, without singing.

VOCATIVE, in grammar, the fifth of nouns. When we name the person we are speaking to, or address ourselves to the thing we are speaking of, as if it were a person, the noun or name requires a new relation, which the Latins and Greeks express by a new termination, called the vocative; as, from dominus, a lord, is formed the vocative domine, O lord.

VOICE, a sound produced in the throat and mouth of an animal, by an apparatus of instruments for that purpose. Voices are either articulate or inarticulate. Articulate voices are those whereof several conpire together to form some syllable or little syllable of sounds; such are the voices expressing the letters of an alphabet, numbers, of which joined together form words. Inarticulate voices are such as are not organized, or assembled into words; such is the barking of dogs, the braying of asses, the hissing of serpents, the singing of birds, &c.

The formation of the human voice, with all the varieties thereof observed in speech, mutter, &c., makes a very curious article of inquiry; and the apparatus and organization of the parts administering thereto, is something exceedingly surprising. Those parts are the trachea or wind-pipe, through which the air passes and repasses into the lungs; the larynx, which is a short cylindrical canal at the head of the trachea; and the glottis, which is a little oval cleft or chink left between two semicircular membranes stretched horizontally within the larynx; which membranes, though capable of joining close together, do generally leave an interval either greater or less between them called the glottis. A particular description of each part may be seen in Anatomy, Part IV.

VOICE, in grammar, a circumstance in verbs, whereby they come to be considered either active or passive; i.e., either expressing an action impressed on another subject, as, I beat; or receiving it from another, as I am beaten. See Grammar, p. 738.

VOICE, in matters of election, denotes a vote or suffrage.

VOLUME, in heraldry, is the fifth flate or cafe of nouns.

When we name the person we are speaking to, or address ourselves to the thing we are speaking of, as if it were a person, the noun or name requires a new relation, which the Latins and Greeks express by a new termination, called the vocative; as, from dominus, a lord, is formed the vocative domine, O lord.

VOLANT, in heraldry, is when a bird in a coat of arms is drawn flying, or having its wings spread out.

VOLATILE, in physics, is commonly used to denote a mixed body whose integral parts are easily diffusible by fire or heat; but is more properly used for bodies whose elements or first component parts are easily separated from each other, and dispersed in air. See Chemistry.

VOLATILIZATION, the act of rendering fixed bodies volatile, or of resolving them by fire into a fine volatile vapour or spirit, which easily diffuses and flies away. All bodies, even the most fixed, as gold, may be volatilized; either of themselves, or with the admixture of some volatile substance, or spirit, by distillation or sublimation.

VOLERY, a great bird-cage, so large that the birds have room to fly up and down in it.

VOLHINIA, or Volonia, a province of Poland, bounded by Poland, on the north; by the lower Volhina, or Ukraine, in the territories of Russia, on the east; by Poland, on the south; and by the province of Red Russia, on the west.

VOLITION, the act of willing. See Metaphysics.

VOLKAMERIA, in botony, a genus of the didynamia class. The calix consists of five segments; and the berry contains two bilocular seeds. There are two species, none of them native of Britain.

VOLLEY, a military salute, made by discharging a great number of fire-arms at the same time.

VOLERO, in Roman antiquity, an appellation given to the slaves, who, during the second Punic war, offered themselves to serve in the army.

VOLI, in the manage, a round or circular tread; and hence by the phrase, to make volis, is understood a gate of two treads, made by a horse going sidewise round a center, in such a manner, that these two treads make parallel tracks, one larger made by the fore-feet, and another smaller made by the hind feet, the group approaching to wards the centre, and the shoulders bearing outwards.

VOLUME, in matters of literature, a book; or writing, of a just bulk to be bound by itself. The name is derived from the Latin volumere, to roll up; the ancient manner of making up books being in rolls of bark or parchment. See Book.

VOLUNTARY, in music, a piece played by a musician extempore, according to his fancy. This is often used before he begins to set himself to play any particular composition, to try the instrument, and to lead him into the key of the piece he intends to perform.

VOLUNTEERS, in the military, perfons who of their own accord, and at their own expense, serve in the army.

VOLUTA, in natural history, a genus of snails belonging to the order of vermes testacese. It is an animal of the snail kind, with an unilocular spiral shell, of which there are 46 species, distinguished by peculiarities in their shells.

VOLUÈ, in architecture, a kind of spiral scroll, used in the
the Ionic and Composite capitals, whereof it makes the principal characteristic and ornament. See Architecture, p. 352.

VOLVULUS, in medicine, a name which some authors give to the ileus passion. See Medicine, p. 114.

VOMIR, in anatomy. See Anatomy, p. 163.

VOMICA, in medicine, is commonly taken for a suppura-
ted impolthume, or an abscess with a suppuration. See Medicine, p. 104.

VOMIT, in pharmacy. See Emetic.

VOMITING, in medicine, a retrograde spasmatic motion

VOORN, one of the islands of Holland, bounded by the

Vortex in the Cartelian philosophy, is a sytem or col-

VORTEX, in meteorology, a whirlwind, or sudden, ra-
pid, and violent motion of the air in gyres, or circles.

VOTE, the suffrage or resolve of each of the members of an assembly, where any affair is to be carried by a majority; but more particularly used for the resolves of the members of either house of parliament.

VOTIVE medals, those on which are expressed the vows of the people for the emperors or empresses. See Medal.

VOW, a solemn and religious promise, or oath. See Oath.

time for accomplishing his vow, he was bound to do it

VOWS, among the Romans, signified sacrifices, offerings,

UPLAND, denotes high ground, or, as some call it, terras

UPPER, in heraldry, is used in respect of shell-fishes,

UPPER, a market-town of Worcestershire, nine miles

UPUPA, in ornithology, a genus belonging to the order of pike. The beak is arcuated, convex, and somewhat

URACHUS, a membranous canal in the fucus of quadru-

URANBURG, or URANiBURG, a castle of Denmark, sit-

URANIGE, a letter which affords a complete

URANUS, one of the planets of the sun. The letters, which, depending on a particular application of

URANUS, a membranous canal in the foetus of quadru-

URANUS, a letter which affords a complete

URANUS, a genera of shells. The letters, which, depending on a particular application of

URANUS, a letter which affords a complete
URANOSCOPEs, in ichthyology, a genus belonging to the order of jugulares. The head is large, rough, and depressed, the upper jaw being shorter than the under one; there are five dentated rays in the membrane of the gills; and the anus is in the middle of the body. There is but one species, found in the Mediterranean sea.

URBINO, a province of Italy, in the pope's territory, bounded by Romania and the gulf of Venice on the north and eait, by the marquisate of Ancona on the south, and by Tuscany on the west, being seventy miles long, and from twenty to fifty broad.

Urbin is also the capital of this province.

UDEs, or UDEs, in heraldry. A crois orde seems to be the same with what we otherwise call chleche, or chleche. See Chleche.

URENA, in botany, a genus of the monadelphia polyanthria class. The calix is double, the exterior one consisting of five segments; the capsule has five cells containing one seed. There are three species, all natives of China.

URETERS, in anatomy. See Anatomy, p. 268.

URETHRA, in anatomy. See Anatomy, p. 272.

URGEL, a town of Spain, in the province of Catalonia, capital of the territory of Urgel, situated on the river Segra, seventy-five miles north of Barcelona.

URI, one of the cantons of Switzerland; bounded by that of Switz, on the north; by Claris and the Grisons, on the east; by Underwald, on the south; and by the Canton of Bern, on the west.

URIM and thummim, among the ancient Hebrews, a certain oracular manner of consulting God, which was done by the high priest, dressed in his robes, and having on his chest or breast-plate.

Various have been the sentiments of commentators concerning the urim and thummim. Josephus, and several others, maintain, that it meant the precious stones used in the high prieft'; and that this was called urim and thummim, because urim signifies some divine virtue and power annexed to the breast-plate of the high priest, by which an oracular answer was obtained from God when he was consulted by him. Spencer believes that the urim and thummim were two little golden figures shut up in the pectoral as in a purse, which gave responses with an articulate voice. In short, there are as many opinions concerning the urim and thummim as there are particular authors that wrote about them. The safest opinion, according to Broughton, seems to be, that the words urim and thummim signify some divine virtue and power annexed to the breast-plate of the high priest, by which an oracular answer was obtained from God when he was consulted by him. And that this was called urim and thummim to express the clearness and perfection which these oracular answers always carried with them; for urim signifies light, and thummim perfection; these answers not being imperfect and ambiguous, like the heathen oracles, but clear and evident. The use made of the urim and thummim was to consult God in difficult cases relating to the whole state of Israel; and sometimes in cases relating to the king, the sanhedrim, the general of the army, or some other great personage.

URINAL, in medicine, a vessel fit to receive and hold urine, and used accordingly for the convenience of sick persons. It is usually of glass, and crooked; and sometimes it is filled with milk, to assuage the pain of the gravel.

URINAL, in chemistry, is an oblong glass vessel, closed for making solutions, and so called from its resemblance to the glasses in which urine is set to settle for the inspection of the physician.

URINE, a serous and saline fluid, of a citron-colour, separated from the blood, and carried by the emulgent arteries to the kidneys, from whence it descends to the bladder by the ureters, and is from time to time emitted thence by the canal of the urethra. See Anatomy, p. 268. For the analysis of urine, see Chemistry, p. 177.

URN, a kind of vase, of a roundish form, but biggest in the middle, like the common pitchers, now seldom used but in the way of ornament over chimney pieces, in buffets, &c. The great use of urns among the ancients, was to preserve the ashes of the dead after they were burnt; for which reason they were called cineraria, and urne cineraria, and were placed sometimes under the tombstone whereon the epitaph was cur; and sometimes in vaults in their own houses. Urns were also used at their sacrifices to put liquid things in.

UROGALLUS, in ornithology. See Tetrao.

URSA, in astronomy. See Astronomy, p. 487.

URSULINES, in church-history, an order of nuns, founded originally by St Angela of Brescia, in the year fifteen hundred thirty seven, and so called from St Ursula, to whom they were dedicated. They observe the rules of St Augustine, and are chiefly noted for taking on them the education and instruction of young maids: their monasteries are a kind of schools where young ladies of the best families receive their education.

URSUS, in zoology, a genus of quadrupeds belonging to the order of fera. There are five forefeet in the upper jaw alternately hollow on the inside, and fix in the under jaw, the two lateral ones being labated; the dog-teeth are solitary and conical; the grinders are five or six; the tongue is smooth; the eyes are furnished with a nictitating membrane; the nose is prominent; and there is a crooked bone in the penis. There are four species, viz. 1. The arctis, or white bear, with an abrupt tail. He is a native of the northern parts of Europe, and feeds upon berries, insects, and the bodies of dead cattle. He is naturally a lazy animal; but when enraged, he becomes agile and furious, standing erect and fighting with his forefeet. When lying, he constantly licks his paws. The female admits the male about the end of October, and the bëbings forth in 112 days. He never attacks a man, unless he be provoked. 2. The meles, has the tail of an uniform colour; the body is ash-coloured above and black below, with a longitudinal black belt across the eyes and ears. He is likewise a native of Europe, and dwells in woods and the cliffs of rocks. He feeds upon eggs, insects, the leaves of the lathynus, &c. In the night he preys upon rabbits, &c and feldom appears in the day. He shuts himself up in a den dug in the earth during the winter, and sucks a pellicle or bladder situated above the anus. 3. The lator, has an annular tail, and a black belt across the eyes. He is found about the sea-shores of America. He feeds upon eggs, fowls, snakes, &c. 4. The laucus, has a long tail; and the body is iron coloured. He is a native of Hudson's bay.

URTICA, in botany, a genus of the monicea tetrandria class. The calix of the male consists of four leaves, and that
that of the female of two valves; neither of them have any corolla; the male has a cup-shaped nectarium, and the female bears one smooth seed. The species are 18, three of them natives of Britain, viz. the pilaster, or Roman nettle; the arum, or lesser nettle; and the drioica, or common mealy.

USUARER, a person charged with a habit or act of usury. See Usury.

USUARIUS CONTRACT, is any bargain or contract whereby by a man is obliged to pay more interest for money than the statute allows.

USURPATION, in law, is an injurious using or enjoyment of a thing for continuation of time, that belongs of right to another.

USURY, in the general, denotes a gain or profit which a person makes of his money, by lending the same; or it is an increase of the principal, exacted for the loan thereof; or the price a borrower gives for the use of a sum credited to him by the lender, called also interest.

The word usury is generally taken in an evil sense, viz. for an unlawful profit which a person makes of his money; in which sense it is, that usury is forbidden by the civil and ecclesiastical, and even by the law of nature. See Law, Tit. xxxiii. 37.

UTERINE, something belonging to the uterus or womb of a woman.

Brother or Sister Uterine, in Scots law. See Law, Tit. xxvii. 3.

UTERUS, in anatomy. See Anatomy, p. 274.

UTILE, a Latin term, signifying profitable or useful; in which sense it is sometimes used by English writers.

UTOXETER, a market-town of Staffordshire, twelve miles south-east of Stafford.

UTRECHT, the capital of a province of the same name, in the united Netherlands, situated twenty-three miles south-east of Amsterdam.

UTRICULARIA, in botany, a genus of the diandria monogynea class. The corolla is ringent and calcareated; the calix consists of two equal leaves; and the capsule of one cell. There are five species, two of them natives of Britain, viz. the vulgaris, or common hooded milfoil; and the minor, or lesser hooded milfoil.

UVA URSI, in botany. See Vaccinium.

UVEA, in anatomy. See Anatomy, p. 289.

VULCANO, or Volcano, in natural history, a burning mountain, or one that vomits forth fire, flame, ashes, cinders, &c.

As to the cause of volcanos, it is found by experience, that there are several inflammable bodies, which, being mixed together in due proportion, will kindle into flame by fermentation alone, without the help of any fiery particles. Thus M. Lemery having covered up in the earth about fifty pounds of a mixture, composed of equal parts of sulphur and filings of iron, tempered with water; after eight or nine hours time, the earth where it lay vomited up flames. From this experiment we see the true cause of the fire of Etna, Vesuvius, and other burning mountains, which probably are made up of sulphur and some other matter proper to ferment with it, and take fire.

VULGATE, a very ancient Latin translation of the Bible, and the only one the church of Rome acknowledges authentic. See Bible.

VULNERARY, in medicine, an epithet given to remedies proper for the cure of wounds and ulcers.

VULPES, the Fox. See Canis.

VULTUR, a genus of birds belonging to the order of accipitres. The head is irrat, and crooked at the point; the head has no feathers, on the forehead being only naked skin; and the tongue is bifid. There are eight species.
WAAG, a river of Hungary, which rises in the Carpathian mountains, on the confines of Poland, and running first from east to west, then turns south, and passing by Leopoldstadt, falls into the Danube, opposite to the island of Schut.

WAAL, a river of the United Netherlands, being one of the branches of the Rhine, which runs from east to west, through the Betu, in the province of Guelderland, passing by Nimoguen, Tiel, Bommel, and Gorcum, and continuing its course easterly, unites its waters with the Maas, and, passing by Dort, falls into the German sea below the Briel.

WADD, or Wadding, is a flopple of paper, hay, straw, or the like, forced into a gun upon the powder, to keep it close in the chamber; or to put up close to the shot, to keep it from rolling out.

WADSET in Scots law. See Law, Tit. xvi., &c.

WAFT. To waft a ship, is to convey her safe, as men of war do merchant ships. To make a waft, is to hang out some coat, sea gown, or the like, on the main shrouds of the ship, as a signal for people to come aboard, and signifying that the ship is in great distress.

WAFERS, or Waffers, are made thus: take very fine flour, mix it with glair of eggs, fift, and a little yeast; mingle the materials; beat them well together; spread the batter, being made thin with gum-water, on even tin plates; and dry them in a stove; then cut them out for use.

You may make them of what colour you please, by tinging the paste with brazil or vermilion for red; indigo or verditer, &c. for blue; saffron, turmeric, or gamboge, &c. for yellow.

WAGGON, a wheel carriage, of which there are various forms, accommodated to the different uses they are intended for. The common waggon consists of the shafts or rads, being the pieces which the hind horse bears upon; the wheels; the flotes, or cross pieces, which hold the shafts together; the bolster, being that part on which the fore wheels and the axle-tree turn in wheeling the waggon across the road; the shell or body of the waggon, having the flaves or rails fixed thereon; the bales, or hoops, which compose the top; the tilt, the place covered with cloth, at the end of the waggon. See Mechanics, p. 50.
WARD, a word of divers significations: thus, a ward in London, is a part of the city committed to the special charge of one of the aldermen of the city. There are twenty-six wards in London, which are as hundreds, and the parishes thereof as towns. A forest is also divided into wards, and so are most of our hospitals.

WARD-HOLDING, in Scots law. See Law, Tit. xi. 1.

WARD-HOOK, or WADD-HOOK, in gunnery, a rod or staff with an iron end turned serpent-wise, or like a screw, to draw the wadding out of a gun when it is to be unloaded. See WADD.

WARDEN, or GUARDIAN, one who has the charge or keeping of any person, or thing, by office. See GUARDIAN.

Such is the warden of the fleet, the keeper of the fleet-prison; who has the charge of the prisoners there, especially such as are committed from the court of chancery for contempt.

Church Wardens. See Church.

WARDHUYS, a port of Norwegian Lapland, 120 miles south-east of the north cape: E. long. 28°; and N. lat. 71°.

WARDMOTHE, in London, is a court so called; which is kept in every ward of the city, answering to the curiata comitia in ancient Rome.

WARDROBE, a closet, or little room adjoining to a bed-chamber, serving to diffuse and keep a person's apparel in; or, for a servant to lodge in, to be at hand to wait, &c.

Market of the wards, in a prince's court, is an apartment where orders of his robbers, wearing apparel, and other necessaries, are preferred under the care and direction of proper officers; as the master of the wardrobe, clerk, &c. of the wardrobe.

WARE, a market-town of Hertfordshire, under the meridian of London, and twenty miles north of that city.

WAREHAM, a borough of Dorsetshire, seventeen miles north-east of Salisbury.

WARN, in law, is to summon a person to appear in a court of justice.

Warming of Tenants, in Scots law. See Law, Tit. xiii. 16.

WARP, in the manufactures, is the threads, whether of silk, wool, linen, hemp, &c. that are extended lengthwise on the weaver's loom; and across which the weaver passes the threads of the woof, to form a cloth, ribband, syltian, or other matter.

WARRANT, in Scots law. See Law, Tit. x. 11.

WARRANT, an act, instrument, or obligation, whereby a person authorizes another to do something which he otherwise had not a right to do.

WARRANTY, a promiss or covenant by deed, made by the bargainer for himself and his heirs, to warrant and secure the bargainee and his heirs against all men for enjoying the thing agreed on between them.

WAREN, a franchise, or place privileged either by prescription or grant from the king, to keep beasts and fow of warren in; as rabbits, hares, partridges, pheasants, &c.

WARRINGTON, a market-town of Lancashire, seventeen miles east of Liverpool.

WARSAW, the capital of Warskia, and of the kingdom of Poland: E. long. 21° 15', and N. lat. 52° 15'.

WARSOVIA, a province of Poland, bounded by Prussia, on the north; by Polachia, on the east; by the province of Little Poland, on the south; and by that of Great Poland, on the west.

WARD, a round knot or knob made with three strands of a rope, so that it cannot fall, by which the tacks, top-sail sheets, and hoppers are made fast, as also some other ropes.

WARD-READED, on board a ship, a name the seamen give to a ship, which, after the comes to her bearing, is built strait up: this way of building, though it does not look well, nor is, as the seamen term it, ship-shape; yet it has this advantage, that a ship is thereby more roomy within board, and becomes thereby a wholesome ship at sea, especially if her bearing be well laid out.

WALL, in architecture, the principal part of a building, as serving both to enclose it, and support the roof, floors, &c. Walls are distinguished into various kinds, from the matter whereof they consist, as of plastered or mud-walls, brick-walls, stone-walls, flint or boulder walls, and boarded-walls. See Architecture.

WALLINGFORD, a borough town of Berkshire, situated on the river Thames, twelve miles north of Reading.

WALLS, the inhabitants of a considerable part of the Spanish Netherlands, viz. those of Artois, Hainault, Namur Luxembourg, and part of Flanders and Brabant.

The Walloon language is said to have been that of the ancient Gauls or Cæls.

WALRUS, in zoology. See Phoca.

WALNUT TREE in botany. See Juglans.

WALSALL, a market-town of Staffordshire, thirteen miles south of St. Ford.

WALSHAM, a market-town of Norfolk, eleven miles north of Norwich.

WALSINGHAM, a market-town of Norfolk, eighteen miles north-west of Norwich.

WALTHAM, a market-town of Leicestershire, sixteen miles north-east of Leicester.

WALTHERIA, in botany, a genus of the monadelphia class.

WAPENTAKE, (from the Saxon) the same with what we call a hundred, and more especially used in the northern counties beyond the river Trent. There have been several conjectures as to the original of the word; one of which is, that anciently makers were made of the armour and weapons of the inhabitants of every hundred; and from these that could not find sufficient pledges of their good abearing, their weapons were taken away, and given to others; whence, it is said, this word is derived.

See Hundred.

WAR, a contest or difference between princes, states, or large bodies of people; which not being determined by the ordinary measures of equity and justice, is referred to the decision of the sword.

WARD, a word of divers significations: thus, a ward in London, is a part of the city committed to the special charge of one of the aldermen of the city. There are twenty-six wards in London, which are as hundreds, and...
A Clock is a machine constructed in such a manner, and regulated by such uniform movements, as to measure time and all its subdivisions with great exactness. The same definition comprehends watches of all kinds; and indeed they are both made upon the same principles. We shall therefore give a view of the construction of both these machines under this article.

**Of the Mechanism of Clocks, and how they measure Time.**

The first figure of Plate CLX is a profile of a clock; P is a weight suspended by a rope that winds about the cylinder or barrel C, which is fixed upon the axis a a; the pivots b b go into holes made in the plates TS, TS, in which they turn freely. These plates are made of brass or iron, and are connected by means of four pillars ZZ; and the whole together is called the frame.

The weight P, if not restrained, would necessarily turn the barrel C with an uniform accelerated motion, in the same manner as if the weight was falling freely from a height. But the barrel is furnished with a ratchet wheel K K, the right side of whose teeth strikes against the click, which is fixed with a screw to the wheel D D, as represented in fig. 2. So that the action of the weight is communicated to the wheel D D, the teeth of which act upon the teeth of the small wheel d which turns upon the pivots e c. This communication of the teeth of one wheel with another is called engrenage or pitching; and a small wheel, like d, is called a pinion.

The wheel E E is fixed upon the axis of the pinion d; and the motion communicated to the wheel D D by the weight is transmitted to the pinion d, consequentally to the wheel E E, as likewise to the pinion e, and wheel F F, which moves the pinion f, upon the axis of which the crown or balance wheel G H is fixed. The pivots of the pinion f play in holes of the plates L M, which are fixed horizontally to the plates T S. In a word, the motion begun by the weight is transmitted from the wheel G H to the palettes I K, which communicates its motion by means of the fork U X riveted on the palettes, to the pendulum A B, which is suspended upon the hook A. The pendulum A B describes, round the point A, an arc of a circle alternately going and returning. If then the pendulum be once put in motion by a pull of the hand, the weight of the pendulum at B will make it return upon itself, and it will continue to go alternately backward and forward till the resistance of the air upon the pendulum, and the friction at the point of suspension at A, destroys the original impressed force. But as, at every vibration of the pendulum, the teeth of the balance wheel G H act upon the palettes I K, (the pivots upon the axis of these palettes play in two holes of the potence r t) that after one tooth H has communicated motion to the palettes K, that tooth escapes; then the opposite tooth G acts upon the palette I, and escapes in the same manner; and thus each tooth of the wheel escapes the palettes I, K, after having communicated their motion to the palettes in such a manner that the pendulum, instead of being flopped, continues to move.

The wheel E E revolves in an hour; the pivot c of this wheel passes through the plate, and is continued to r; upon the pivot is a wheel N N with a long socket fastened in the centre; upon the extremity of this socket r the minute-hand is fixed. The wheel N N acts upon the wheel O; the pinion of which, p, acts upon the wheel g g, fixed upon a socket which turns along with the wheel N. This wheel g g makes its revolution in 12 hours, upon the barrel of which the hour-hand is fixed.

From the above description it is easy to see, 1. That the weight p turns all the wheels, and at the same time continues the motion of the pendulum. 2. That the quickness of the motion of the wheels is determined by that of the pendulum. 3. That the wheels point out the parts of time divided by the uniform motion of the pendulum.

When the cord upon which the weight is suspended is entirely run down from off the barrel, it is wound up again by means of a key, which goes on the square end of the arbor at Q, by turning it in a contrary direction from that in which the weight descends. For this purpose, the inclined side of the teeth of the wheel R (fig. 2) removes the click C, so that the ratchet-wheel R turns while the wheel D is at rest: But as soon as the cord is wound up, the click falls in between the teeth of the wheel D and the right side of the teeth again act upon the end of the click, which obliges the
the wheel D to turn along with the barrel; and the spring A keeps the crank between the teeth of the ratchet-wheel R.

We shall now explain how time is measured by the motion of the pendulum; and how the wheel E, upon the axis of which the minute-hand is fixed, makes but one specific revolution in an hour. The vibrations of a pendulum are performed in a shorter or longer time in proportion to the length of the pendulum itself. A pendulum of 3 feet 9¾ French lines in length, makes 3600 vibrations in an hour; i.e., each vibration is performed in a second of time, and for that reason it is called a second pendulum. But a pendulum of 9 inches 2¾ French lines makes 7200 vibrations in an hour, or two vibrations in a second of time, and is called a half-second pendulum. Hence, in constructing a wheel whose revolution must be performed in a given time, the time of the vibrations of the pendulum which regulates its motion must be considered. Supposing, then, that the pendulum AB makes 7200 vibrations in an hour, let us consider how the wheel E shall take up an hour in making one revolution. This entirely depends on the number of teeth in the wheels and pinions. If the balance-wheel consists of 30 teeth, it will turn once in the time that the pendulum makes 60 vibrations; for at every turn of the wheel, the same tooth acts once on the palette I, and once on the palette K, which occludes two separate vibrations in the pendulum; and the wheel having 20 teeth, it occasions twice 30, or 60 vibrations. Consequently, this wheel must perform 120 revolutions in an hour; because 60 vibrations, which it occasions at every revolution, are contained 120 times in 7200, the number of vibrations performed by the pendulum in an hour. Now in order to determine the number of teeth for the wheels E, F, and their pinions e, f, it must be remarked, that one revolution of the wheel E must turn the pinion e as many times as the number of teeth in the pinion is contained in the number of teeth in the wheel. Thus, if the wheel E contains 72 teeth, and the pinion e 6, the pinion will make twelve revolutions in the time that the wheel makes one; for each tooth of the wheel drives forward a tooth of the pinion, and when the six teeth of the pinion are moved, a complete revolution of the pinion is made. Consequently, the wheel D performs 10 times while the wheel performs one. Now, the wheel E being turned by the pinion e, makes 12 revolutions for one of the wheel E; and the pinion f makes ten revolutions for one of the wheel F; consequently, the pinion f performs 10 times 12 or 120 revolutions in the time the wheel E performs one. But the wheel G, which is turned by the pinion f, occasions 60 vibrations in the pendulum each time it turns round; consequently the wheel G occasions 60 times 120 or 7200 vibrations of the pendulum while the wheel E performs one revolution; but 7200 is the number of vibrations made by the pendulum in an hour, and consequently the wheel E performs but one revolution in an hour; and so of the rest.

From this reasoning, it is easy to discover how a clock may be made to go for any length of time without being wound up: 1. By increasing the number of teeth in the wheels. 2. By diminishing the number of teeth in the pinions. 3. By increasing the length of the cord that suspends the weight; and lastly, by adding to the number of wheels and pinions. But, in proportion as the time is augmented, if the weight continues the same, the force which it communicates to the last wheel GH will be diminished.

It only remains to take notice of the number of teeth in the wheels which turn the hour and minute hands.

The wheel E performs one revolution in an hour; the wheel NN, which is turned by the axis of the wheel E, must likewise make only one revolution in the same time; and the minute-hand is fixed to the barrel of this wheel. The wheel N has 30 teeth, and acts upon the wheel O, which has likewise 30 teeth, and the same diameter; consequently the wheel O takes one hour to a revolution: now the wheel O carries the pinion p, which has six teeth, and which acts upon the wheel q of 72 teeth; consequently the pinion p makes 12 revolutions while the wheel qq makes one, and of course the wheel qq takes 12 hours to one revolution; and upon the barrel of this wheel the hour-hand is fixed. We shall conclude with remarking, that all that has been said here concerning the revolutions of the wheels, &c. is equally applicable to watches as to clocks.

The wheels of a watch, like those of a clock, are placed in a frame formed of two plates and four pillars. Fig. 3. represents the inside of a watch, after the plate (fig. 5.) is taken off. A is the barrel which contains the spring (fig. 6.) which serves in place of a weight, to give motion to the wheels and balance.

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Watches, as well as clocks, are composed of wheels and pinions, and a regulator to direct the quickness or slowness of the wheels, and of a spring which communicates motion to the whole machine. But the regulator and spring of a watch are vastly inferior to the weight and pendulum of a clock, neither of which can be employed in watches. In place of a pendulum, therefore, we are obliged to use a balance (fig. 4.) to regulate the motion of a watch; and of a spring (fig. 6.) which serves in place of a weight, to give motion to the wheels and balance.

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WATCH and CLOCK WORK.

HII. (fig. 4.) The pivot I, in the end of the verge, enters into the hole c in the potance A (fig. 5.) In this figure the palettes are represented; but the balance is on the other side of the plate, as may be seen in fig. 11. The pivot of the balance enters into a hole of the cock BC, (fig. 10.) A perspective view of which is represented in (fig. 12.) Thus the balance turns between the cock and the potance c, (fig. 5.) as in a kind of cage. The action of the balance-wheel upon the palettes 1, 2, (fig. 4.) is the same with what we have described with regard to the same wheel in the clock; i.e., in a watch the balance wheel obliges the balance to vibrate backwards and forwards like a pendulum. At each vibration of the balance a palette allows a tooth of the balance-wheel to escape, so that the quickness or slowness of the motion of the wheels is entirely determined by the quickness of the vibrations of the balance, and these vibrations of the balance and motion of the wheels are produced by the action of the spring.

But the quickness or slowness of the vibrations of the balance depend not solely upon the action of the great spring, but chiefly upon the action of the spring a, b, c, called the spiral spring, (fig. 14.) Situated under the balance H, and represented in perspective (fig. 11.) The exterior end of the spiral is fixed to the pin a, (fig. 14.) This pin is applied near the plate in a, (fig. 11.) The interior end of the spiral is fixed by a peg to the centre of the balance. Hence if the balance is turned upon itself, the plates remaining immovable, the spring will extend itself, and make the balance perform one revolution. Now, after the spiral is thus extended, if the balance be left to itself, the elasticity of the spiral will bring back the balance, and in this manner the alternate vibrations of the balance are produced.

In fig. 7 all the wheels above described are represented in such a manner, that you may easily perceive at first sight how the motion is communicated from the barrel to the balance.

In fig. 8. are represented, the wheels under the dial-plate by which the hands are moved. The pinion a is adjusted to the force of the prolonged pivot of the wheel D, (fig. 7.) and is called a cannon pinion. This wheel revolves in an hour. The end of the axis of the pinion a, upon which the minute-hand is fixed, is square; the pinion (fig. 8.) is indented into the wheel A, which is carried by the pinion a. Fig. 9. is a wheel fixed upon a barrel, into the cavity of which the pinion (a) enters, and upon which it turns freely. This wheel, (d) revolves in 12 hours, and carries along with it the hour-hand.

WATCHING, in medicine, is produced by too great a determination of the nervous fluid to the organs of the senses; whereby these organs are prepared to receive, readily, any impressions from external objects, which they propagate to the brain, and furnish the soul with divers occasions of thinking. See Medicine, p. 157.

WATER, in physiology, a simple fluid, and liquid body, reputed the third of the four vulgar elements. See Chemistry, p. 67. and Hydrostatics.

Holy Water, a water prepared every Sunday in the Roman church, with divers prayers, exorcisms, &c. used by the people to cross themselves withal at their entrance to and going out of church; and pretended to have the virtue of washing away venial sins, driving away devils, prevailing from thunder, dissolving charms, curing from, or curing diseases, &c. Many of the reformed took the use of holy water to have been borrowed from the lustral water of the ancient Romans.

Water ordeal, or Trial, among our ancestors, was of two kinds, by hot and by cold water. Trial or purgation, by boiling or hot water, was a way of proving crimes, by immerging the body, or the arm, in hot water, with divers religious ceremonies. In the judgment by boiling water, the accused, or he who perjured the accused, was obliged to put his naked arm into a caldron full of boiling water, and to draw out a stone thence placed at a greater or less depth, according to the quality of the crime. This done, the arm was wrapped up, and the judge set his seal on the cloth; and at the end of three days they returned to view it; when if it were found without any scald, the accused was declared innocent. The nobles or great personages purged themselves thus by hot water, and the populace by cold water. The trial, or purgation, by cold water, was thus: After certain prayers and other ceremonies, the accused was swaddled or tied up all in a peloton or lump, and thus cast into a river, lake, or well, of cold water; where if he sunk, he was held criminal; if he floated, innocent.

In the Levitical law, we find mention made of water which proved to prove whether or no a woman was an adulteress; the formula, as it was performed by the priest, may be seen in the fifth chapter of the book of Numbers.

Water, among jewellers, is properly the colour or lustre of diamonds and pearls. The term, though less properly, is sometimes used for the hue or colour of other stones.

Water beetle, in zoology. See Dytiscus.

Water-borne, in the sea-language. A ship is said to be water-borne, when she is where there is no more water than will barely bear her from the ground; or when lying even with the ground, the ruff begins to float or foam.

Water colours, in painting, are such colours as are only diluted and mixed up with gum-water, in contradistinction to oil-colours.

Water-gang, a channel cut to drain a place by carrying off a stream of water.

Water line of a ship, a line which distinguishes that part of her under water from that above, when she is duly laden.

Water-men, are such as row in boats, or ply on the river Thames, in the government of whom the lord-mayor and court of aldermen there, had always the taking more than which makes them liable to a fine of 40l. and half a year's imprisonment.

Water-shoot, a young sprig which springs out of the root or block of a tree.

Water shot, in the sea-language, a fort of riding at anchor, when a ship is moored neither close the tide, nor right up and down, but quartering between both.

Water-table, in architecture, a foot of ledge left in stone.
WATCH and CLOCK WORK.
Water-works, in general, denote all manner of machines

WATERING, in the manufactures, is to give a lustre to

WATLINGTON, a market-town of Oxfordshire, situated

WAVE, in philosophy, a cavity in the surface of water,

water from running down there.

wall begins to abate.

from the ground, from which place the thickness of the

Hone or brick-walls, about eighteen or twenty inches

drifts, may be called water-works. See Hydro-

fluffs, &c. by wetting them lightly with gum-water, and

therwise the folds of the fluffs will stick together: the o-

WAX, or Beer Wax, in natural history, a firm and solid

WAVE, in heraldry, is said of a bordure, or any ordi-

WAVED, in heraldry, is said of a bordure. or any ordi-

WAVING, in the sea-language, is the making signs to a

The gum water ought to be pure, thin, and clear, o-

WAVE-offering, in Jewish antiquity, a sacrifice offered

From the common yellow wax, by the bare effect of

WAX, or Beer Wax, in natural history, a firm and solid

WAVE-offering, in Jewish antiquity, a sacrifice offered

WAVING, in the sea-language, is the making signs to a
erations of the intellefines; but its great ufe is in the ma-
king ointments and plasters for external fufe, and the greater
part of thofe of the fshops owe their confiffence to it.
The white-wax is alfo an ingredient in fome of the ce-
rates and ointments of the fshops; and is ufed in making
balls, and in many of the nicer arts and manufactures,
where wax is required.

Sealing. Wax is made in the following manner: Take one
pound of bees wax; three ounces of fine turpentine; o-
live-oil, and rosin, finely powdered, of each one ounce:
when they are well melted, and the dros taken off, put
in an ounce and a half of vermilion, or red-lead, finely
ground, and stir them together till they are well incor-
porated: and when this mixture grows a little cool, roll
it into flecks, or in any other form. If you would have
it black, instead of vermilion, or red-lead, put in lamp-
black. The soft, red, and green-wax, ufed in large
feals to fome of our law writings, are thus made: Melt
bees-wax over a gentle heat, with fuch a proportion of
Venice turpentine as, when cold, will give it the due
concifence; this is determined by repeated trials, firft
putting in but little turpentine, and afterwards more and
more, till by dropping a piece upon a marble to cool, it
is found of the true concifence. They then colour it
with red-lead, or vermilion, or with yerditer, or whatever
colours they pleafre, the mixture in this flate re-
cieving any.

Wax work, the representation of the faces, &c. of
persons living or dead; made by applying platter of
Paris in a kind of paste, and thus forming a mould con-
taining the exact representation of the features. Into
this mould melted wax is poured, and thus a kind of
molds are formed; which being painted and fet with
glass eyes, and the figures dreffed in their proper habits,
they bear fhuch a resemblance that it is difficult to diftin-
guish between the copy and the original.

Way, a paffage or road.
The Roman ways are divided into confular, praetorian,
military, and public; and of thofe we have four remark-
able ones in England: the firft, Watling-street, or Wa-
theling-street, leading from Dover to London. Duntlable,
Touefer, Atterton, and the Severn, extending as far
as Anglesea in Wales. The second, called Hikenild, or
Iltenil-street, stretches from Southampton over the river
Ips at Newbridge; thence by Camden and Litcheld;
then paffes the Derwent, near Derby, and ends at Tin-
mouth. The third, called Poftis-way, because in fome
places it was neverperfected, but lies as a large ditch,
leads from Cornwall through Devonshire, by Tewthury,
neai Snow in the Wolds; and from Coventry to Leice-
ter, Newark, and to Lincoln. The fourth, called
Erming, or Erming-street, extends from St. David’s,
in Wales, to Southampton.

Way of a ship, is fometimes the fame as her rafe, or run
forward or backward: but this term is molt commonly
underflood of her failing.

Way-wufe, a title given to the governors of the chief
places in the empire of Muscovy, as also in Poland.

Weave, or Weer, a great flank or dam in a river, fitted
for the taking of fish, or for conveying the stream to a
mill.

New wears are not to be made, or others altered, to
the nuisance of the public, under a certain penalty.

Weasel, in zoology. See Mustela.

Weather, the state or disposition of the atmosphere with
regard to heat, cold, wind, rain, fnow, &c.

As it is in the atmosphere that all plants and animals
live, and as that appears to be the great principle of moft
animal and vegetable productions, alterations, &c. there
does not feem any thing, in all philofophy, of more im-
mediate concernment to us than the state of the weather,
and a knowledge of the great influence it has on our bo-
dies. What vail, but regular, alterations a little turn of
weather makes in a tube filled with mercury, or spirits
of wine, or in a piece of ftring, &c. every body knows,
in the common infance of barometers, thermometers, &c.
and it is owing partly to our inattention, and partly to
our unequal and intemperate courfe of living, that we do
not feel as great and regular ones in the tubes, chords,
and fibres of our own bodies.

Weathercock, a moveable vane in form of a cock, or
other fhape, placed on high, to be turned round accord-
ing to the direftion of the wind, and point out what
quarter the wind blows from.

Weather-glasses. See Barometer, and Thermom-
eter.

Weather-glass. See Barometer, and Thermom-
eter.

Weathering, among sailors, signifies the doubling,
or failing by a head land, or other place.

Weaving, the art of working a web of cloth, filk, or
other stuff, in a loom with a shuttle. For the manner of
performing which, see Cloth.

Web, a fort of fiftue or texture formed of threads inter-
woven with each other; fome whereof are extended in
length, and called the warp; and others drawn acrofs,
and called the woof. See Cloth.

Spider’s Web. See Aranea.

Wedge, one of the mechanical powers. See Mecha-
nics.

Wednesday, the fourth day of the week, so called
from a Saxon idol named Weden, supposed to be Mars,
worshippd on this day.

After Wednesday, the fird day of Lent, fo called from
the cultom obferved in the ancient christian church of
penitents expressing their humiliation at this time, by ap-
ppearing in fackcloth and ashes.

Weed, a common name for all rank and wild herbs, that
grow among. Others, to the detriment of other ufeful herbs
they grow amonng.

Weed, in the miners language, denotes the degeneracy
of a load or vein of fine metal into an ufelefs maraffe.

Week, in chronology, a divifion of time comprifing fe-
ven days. See Astronomy, p. 489.

The origin of this divifion of weeks, or of computing
time by fevens, is greatly controverted. Some will have
it to take its life from the four quarters or intervals
of the moon, between her changes or phases, which, be-
ing about seven days distant, gave occasion to the divifion.
Be this as it v/ill, the divifion is certainly very an-
cient. The Syrians, Egyptians, and molt of the orient-
al nations, appear to have ufed it from all aniquity:
though it did not get footing in the weft till Chriflianity
brought it in: the Romans reckoned their days by seven-
ths, but by ninths, and the ancient Greeks by de-
cads or tenths.

Indeed, the Jews divided their time by weeks, but it
was upon a different principle from the earthen nations.
God himself appointing them to work six days, and to rest the sabbath, in order to keep up the sense and remembrance of the creation; which being effected in six days, he rested the seventh.

Puritton Week, or the Holy Week, is the last week in Lent, wherein the church celebrates the mystery of our Saviour's death and passion.

Week, or Wyck, in geography, a parliament and port-town of Scotland, in the shire of Carnwath: W. long. 2° 45', N. lat. 58° 45'.

WEEVER, in ichthyology. See Trachin us.

Weight, in physics, a quality in natural bodies whereby they tend downwards, towards the centre of the earth. Or, weight may be defined, in a less limited manner, to be a power inherent in all bodies whereby they tend to some common point, called the centre of gravity; and that with a greater or less velocity, as they are more or less dense, or as the medium they pass through is more or less rare. See Mechanics.

Weight, in commerce, denotes a body of known weight, appointed to be put in the balance against other bodies whose weight is required.

Well, or Wel, an imperial city of Germany, in the circle of Swabia, and duchy of Wirtemberg: E. long. 8° 40', N. lat. 48° 40'.

Weimar, a city of Germany, in the circle of Upper Saxony, the capital of the Weimar: E. long. 11° 25', N. lat. 51°.

Weisel, a river of Poland, and the same with the Vistula.

Weismar, a city of Germany, in the duchy of Cleves: E. long. 2° 45', N. lat. 51° 37'.

Westlow, a borough town of Cornwall, twenty-three miles north-west of Salisbury; which sends two members to parliament.

Westmeath, a county of Ireland, in the province of Leinster, bounded by Longford and Cavan on the north; by Eastmeath, on the east; by King's County, on the south; and by the river Shannon, which divides it from Roscommon, on the west.

Westminster, a city which forms the west part of the town which goes by the general name of London; but is under a distinct government; the dean and chapter appointing the high steward, high bailiff, and other officers, who have the government of the city. Here are the king's palaces, and the houses of most of the nobility.
bility, the high court of parliament, and the supreme courts of justice; but there is no bishop of this city. It elects two members of parliament.

WESTMORELAND, an English county, bounded by Cumberland on the north, by Yorkshire on the east, by Lancashire on the south, and by the Irish channel on the west.

WESTPHALIA, the north-west circle of the empire of Germany; bounded by the German ocean, on the north; by the circle of Lower Saxony, on the east; by the Landgraviate of Hesse, the Palatinate of the Rhine, and the electorate of Trier, on the south; and by the Netherlands, on the west: being 200 miles in length, and from 150 to 200 in breadth.

WESTRAML, a market town of Kent, under the meridian of London, 44 miles west of Canterbury.

WETTERAVIA, the southern division of the Landgraviate of Hesse, in Germany, lying along the northern bank of the river Maine, comprehending the counties of Hanau and Nassau.

WETZLAR, an imperial city of Germany, in the circle of the Upper Rhine and territory of Wetteravia situated on the river Lahn, E. long. 8° 15', N. lat. 50° 30'.

WEXFORD, a county of Ireland, in the province of Munster, bounded by the county of Wicklow on the north, by the ocean on the east and south, and by Kilkenney and Waterford on the west.

Wexford, the capital of this county, is situated at the mouth of the river Slaney, sixty five miles south of Dublin.

WEYMOUTH, a port-town of Dorsetshire, situated on a fine bay of the English channel; seven miles south of Dorchester. It sends two members to parliament.

WHALE, in ichthyology. See Baleana and Physeter.

WHARF, a space on the banks of a haven, creek, or hith, provided for the convenient loading and unloading of vessels upon.

WHEAT, in botany. See Triticum. For the culture of wheat, see Agriculture, p. 60.

WHEEL, in mechanics, a simple machine, consisting of a round piece of wood, metal, or other matter, which revolves on an axis. See Mechanics.

HELP, the young of a dog, fox, lion, or any wild beast.

HELP, in a ship, the seaman's term for those brackets which are set up on the capstan close under the bars; they give the sweep to it, and are so contrived that the cable winding about them may not surge so much as it might otherwise do if the body of the capstan were quite round and smooth.

WHETSTONE, a stone which serves for the whetting of knives and other tools upon.

WHEY, the serum, or watery part, of milk. See Whey.

WHIG, a party in Britain, opposed to the Tories, from whom they differ chiefly in their political principles. See Tories.

The names of whig and tory were not known till a bout the middle of the reign of Charles II. when these were given as party distinctions. These parties may be considered either with regard to the state, or to religion. The state tories are either violent, or moderate: the first would have the king to be absolute, and therefore plead for passive obedience, non-resistance, and the hereditary right of the house of Stuart. The moderate tories would not suffer the king to lose any of his prerogative; but then they would not sacrifice those of the people. The state whigs are either strong republicans, or moderate ones. The first, says Rapin, are the remains of the party of the long parliament, who attempted to change monarchy to a commonwealth: but these make so slender a figure, that they only serve to strengthen the party of the other whigs. The tories would persuade the world, that all the whigs are of this kind; and the whigs, would make us believe that all the tories are violent. The moderate state-whigs are much in the same sentiments with the moderate tories and desire that the government may be maintained on the ancient foundation: all the difference is, that the first bear a little more to the parliament and people, and the latter to that of the king. In short, the old whigs were always jealous of the encroachments of the royal prerogative, and watchful over the preservation of the liberties and properties of the people.

WHIP, or whip-staff, in a ship, a piece of timber, in form of a strong staff, fastened into the helm, for the steerman, in small ships, to hold in his hand, in order to move the rudder and direct the ship.

WHIRLPOOL, an eddy, vortex, or gulph, where the water is continually turning round.

These in rivers are very common, from various accidents, and are usually very trifal, and of little consequence. In the sea they are more rare, but more dangerous. Sibbald has related the effects of a very remarkable marine whirlpool among the Orcades, which would prove very dangerous to strangers, though it is of no consequence to the people who are used to it. This is not fixed to any particular place, but appears in various parts of the limits of the sea among those islands. Wherever it appears, it is very furious; and boats, &c. would inevitably be drawn in and perish with it; but the people who navigate them are prepared for it, and always carry an empty vessel, a log of wood, or large bundle of straw, or some such thing, in the boat with them; as soon as they perceive the whirlpool, they toss this within its vortex, keeping themselves out of this sub stance, whatever it be. is immediately received into the centre, and carried under water; and as soon as this is done, the surface of the place where the whirlpool was becomes smooth, and they row over it with safety; and in about an hour they see the vortex begin again in some other place. Usually at about a mile's distance from the first.

WHIRLWIND, a wind that rises suddenly is exceedingly rapid and impetuous when first seen, but is soon spent. See Pneumatics, p. 495.

WHISPERING. See the articles Hearing, Attention, &c.

Whispering places depend upon this principle. If the vibrations of the tremulous body are propagated through a long tube, they will be continually reverberated from the sides of the tube into its axis and by that means prevented from spreading, till they get out of it; whereby they will be exceedingly increased, and the sound rendered much louder than it would otherwise be.

Hence it is that sound is conveyed from one side of a whispering gallery to the opposite side, without being perceived by those who stand in the middle.

WHIST,
WHIST, a well-known game at cards; so called from the silence observed during the play.

WHITBY, a port-town of the north riding of Yorkshire, situated on the German sea, thirty-eight miles north-east of York.

WHITCHURCH, a borough-town of Hampshire, situated ten miles north of Winchester. It sends two members to parliament.

WHITE, one of the colours of natural bodies.

White of the eye, denotes the first tunic or coat of the eye, called albuginea. See Anatomy, p. 289.

WHITE PRIESTS, a name common to several orders of monks, from their being clothed in a white habit.

WHITE-HORSE, in ichthyology. See Balaena.

WHITE-LEAD. See Ceruse.

WHITBY, a port-town of the north riding of Yorkshire, situated on the German sea, thirty-eight miles north-east of York.

WHITE SEA, in geography, a bay of the frozen ocean, in the north of Muscovy, between Russian Lapland and Samoecia.

WHITE WINE, wine of a bright transparent colour, bordering on white, thus called to distinguish it from the red wines. See Wine.

WHITEHAVEN, a port-town of Cumberland, situated on the Irish channel: W. long. 3° 16', N. lat. 53° 30'.

WHITENESS, the quality which denominates a body white.

WHITING, in ichthyology. See Gavius.

WHITE-HORSE, in ichthyology. See Balaena.

WHITSUNDAY, a solemn festival of the Christian church, observed on the fiftieth day after Easter, in memory of the descent of the Holy Ghost upon the apostles in the ancient church, those who were baptized put on white garments, as types of that spiritual purity they received in baptism. As the descent of the Holy Ghost upon the apostles happened upon the day which the Jews called pentecost, this festival retained the name of pentecost among the Christians.

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WHITING, in ichthyology. See Gavius.

WHITES, in medicine, the same with flour albus. See Medicine, p. 162.

WHITSUNDAY, a solemn festival of the Christian church, observed on the fiftieth day after Easter, in memory of the descent of the Holy Ghost upon the apostles in the visible appearance of fiery cloven tongues, and of those miraculous powers which were then conferred upon them.

It is called Whitunday, or White Sunday, because being one of the flatted times for baptism in the ancient church, those who were baptized put on white garments, as types of that spiritual purity they received in baptism. As the descent of the Holy Ghost upon the apostles happened upon the day which the Jews called pentecost, this festival retained the name of pentecost among the Christians.

W BURG, the capital of the territory of the same name in Juliana: E. long. 96° 16', N. lat. 56° 20'.

WIBURG, a city and port-town of Russian Finland, situated on the gulf of Finland: E. long. 29° 50', N. lat. 61°.

WICCOMBE CHIPPING, a borough town of Bucks, twelve miles south of Aylesbury. It sends two members to parliament.

WICK DE DUERSTEDE, a town of the United Netherlands, in the province of Utrecht, fifteen miles south-east of the city of Utrecht.

WICKER, a twig of the osier shrub, single or wrought.

WICKET, a small door in the gate of a fortified place, or a hole in a door, through which to view what passes without.

WICKLIFFISTS, or Wickliffites, a religious sect which sprang up in England in the reign of Edward III. and took its name from John Wickliff, doctor and professor of divinity in the university of Oxford, who maintained that the substance of the sacramental bread and wine remained unaltered after consecration; and opposed the doctrine of purgatory, indulgences, auricular confession, the invocation of saints, and the worship of images. He maintained, that the children of the religious may be saved without being baptized; that priests may administer confirmation; that there ought to be only two orders in the church, that of priests, and that of deacons.

He made an English version of the Bible; and composed two volumes, called Aletheia, that is, Truth, from which John Hulla learned most of his doctrines. In short, to this reformer we owe the first hint of the reformation, which was effected about two hundred years after.

WICKLOW, a county of Ireland, in the province of Leinster, bounded by the county of Dublin on the north, by the Irish channel on the east, by Wexford on the south, and by Kildare and Katerlagh on the west.

WICKWARE, a market-town of Gloucestershire, situated twenty miles south of Gloucester.

WIDGEON, in ornithology. See Anas.

WIDOW, a woman who has lost her husband.

WIFE, a married woman, or one joined with, and under the protection of, a husband. See Husband.

WIG IN, a borough-town of Lancashire, twenty nine miles south of Lancaster. It sends two members to parliament.

WIFOL, part of the county of Southampton, and separated from it by a narrow channel, is about twenty miles long, and twelve broad. The chief town is Newport.

WIGTOWN, a borough and port-town of Scotland, in the shire of Galloay, situated on a bay of the Irish channel, ninety miles south-west of Edinburgh.

WILD, or WIL, in law, signifies the declaration of a man's mind and intent relating to the disposition of his lands, goods, or other estate, or of what he would have done after his death.

In the common law, there is a distinction made between a will and a testament; as that is called a will, where lands or tenements are given; and when the disposition concerns goods and chattels alone, it is termed a testament. See Testament.

WILL-WITH-A-WISP, or Jack-with-a-lantern, a meteor chiefly seen in summer-nights, frequenting meadows, marshes, and other moist places. It seems to arise from a vitreous exhalation, which being kindled in the air, reflects a fort of thin flame in the dark, without any sensible heat.

It is often found flying along rivers, hedges, &c. by reason it there meets with a stream of air to direct it. The ignus fatuus, says Sir Isaac Newton, is a vapour shining without heat; and there is the same difference between this vapour and flame, as between rotten wood shining without heat and burning coals of fire.

WILLIAMSBURG, capital of the colony of Virginia, situated in James-county, between James-river and York-river: W. long. 76° 30', N. lat. 39° 20'.

WILLIAM'S FORT, a fort belonging to the English East-India
India company, situated on the western branch of the river Ganges, in the province of Bengal: E. long. 89°, N. lat. 2° 45'.

WILLIAMSTAT, a port-town of Holland, situated on the sea called Hollands-Deep, fourteen miles south of Rotterdam.

WILLOW, in botany. See Salix.

WILNA, a city of Poland, capital of the great duchy of Lithuania, situated on a river of the same name: E. long. 23° 15', N. lat. 55°.

WILTON, a borough-town of Wiltshire, situated on the river Willey, six miles north-west of Salisbury. It sends two members to parliament.

WILTSHIRE, a county of England, bounded by Gloucestershire and Oxfordshire on the north, by Berkshire and Hampshire on the east, by Dorsetshire on the south, and by Somersetshire on the west.

WINCHELESEA, a borough and port-town of Sussex, situated on a bay of the English channel, thirty miles east of Lewes. It sends two members to parliament.

WINCHESTER, the capital city of Hampshire, situated on the river Itching, six miles east of Salisbury. It sends two members to parliament.

WINCHREST, the capital city of Hampshire, situated on the river Itching, sixty-five miles south-west of London.

WIND. See Pneumatics, p. 495.

Wind-mill, a kind of mill, the internal parts of which are much the same with those of a water-mill; from which, however it differs, in being moved by the impulfe of the wind upon its vane, or blade, which are to be considered as a wheel on the axle. See Mechanics.

Wind-flower, in botany. See Anemone.

Wind-galley, a name given by our farriers to a distemper of horses. See Farriery, p. 375.

Wind sails, in a ship, are made of the common sail-cloth, and are usually between twenty-five and thirty feet long, according to the size of the ship, and are of the form of a cone ending obtusely: when they are made use of, they are hoisted by ropes to about two thirds or more of their height, with their bases diffended circularly by hoops, and their apex hanging downwards in the hatch ways of the ship; above each of these, one of the common sails is so difposed, that the greatest part of the air rushing against it, is directed into the wind-sail, and conveyed, as through a funnel, into the upper parts of the body of the ship.

Wind tackle-blocks, in a ship, are the main double blocks which being made fast to the end of a small cable, serve for hoisting of goods into the ship, &c.

To wind, or wind a ship, signifies to bring her head about. How winds or winds the ship? is a question asked by mariners, concerning a ship under sail; signifying as much as, upon what point of the compass does she lie with her head?

Windward, in the sea-language, denotes any thing towards that point from whence the wind blows, in respect of a ship: thus windward-tide, is the tide which runs against the wind.

Wingage of a gun, the difference between the diameter of the bore, and the diameter of the ball.

Windlass, a machine used to raise huge weights withal, as guns, blocks, an hors, &c.

It is very simple, consisting only of an axis, or roller, supported horizontally at the two ends, by two pieces of wood and a pulley: the two pieces of wood meet at top, being placed diagonally so as to prop each other; the axis, or roller, goes through the two pieces, and turns in them. The pulley is fastened at top where the pieces join. Lastly, there are two flaves or handspikes which go through the roller, whereby it is turned, and the rope which comes over the pulley is wound on and off the same.

Windlass, in a ship, is an instrument in small ships, placed upon the deck, just abait the fore mast. It is made of a piece of timber six or eight feet square, in form of an axle-tree, whose length is placed horizontally upon two pieces of wood at the ends thereof, and upon which it is turned about by the help of handspikes put into holes made for that purpose. This instrument serves for weighing anchors, or hoisting of any weight in or out of the ship, and will purchase much more than any capstan, and that without any danger to those that heave; for if in hearing the windlass about, any of the handspikes should happen to break, the windlass would fall of itself.

WINDOW, an aperture or open place in the wall of a house, to let in the wind and light. See Architecture, p. 257.

WINDSOR, a borough-town of Berkshire, twenty miles west of London, most remarkable for the magnificent palace or castle situated there on an eminence, which commands the adjacent country for many miles, the river Thames running at the foot of the hill. The knights of the garter are installed in the royal chapel here. It sends two members to parliament.

WINE, a brim, agreeable, spirituous and cordial liquor, drawn from vegetable bodies, and fermented.

All sorts of vegetables, fruits, seeds, roots, &c. afford wine; as grapes, currants, mulberries, elder-berries, cherries, apples, pulle, beans, pea, turneps, radishes, and even grass itself. Hence under the class of wines, or vinous liquors, come not only wines absolutely so called, but also ale, cider, &c. See Brewing, and Chemistry, p. 95, 161.

Wine in France is distinguished, from the several degrees and steps of its preparation, into, 1. Mere goutte, mother-drop, which is the virgin wine, or that which runs itself out at the top of the vat wherein the grapes are laid, before the vintager enters to tread or stamp the grapes. 2. Muid, furmuil, or flum, which is the wine or liquor in the vat, after the grapes have been trod or flamped. 3. Pressed wine, being that squeezed with a press out of the grapes half bruised by the treading. The hulks left of the grapes are called rope, murk, or mark; the mother-drop, which is the virgin wine, or that which has not yet worked nor fermented. 4. Bouru, cyderkin, and called boisson. 4. Sweet wine, is that which has been prevented working by calling in cold water. 6. Worked wine, that which has been let work on its own account, and which by thorough work has made itself ferment. Strained wine, that made by deeping dry grapes in water, and letting it ferment of itself. Wines are also distinguished with regard to their colour into white wine, red wine, claret wine, pale wine, rofe, or black wine; and with regard to their country, or the soil that produces them, into French wines, Spanish wines, Rhine wines, Hungarian wines, Greek wines, Canary wines, &c. and more particularly...
The inhabitants of Lapland have a wire of a kind. The women do this business, and the way they take is to melt a piece of tin, and place it rounded on all sides but one, where it is flat. They often fell it to strangers, under the notion of its having certain magical virtues.

**WIRKSWORTH** a market-town of Derbyshire, situated six miles north of Darby.

**WISEBEACH** a market-town of the isle of Ely, in Cambridgeshire, situated fifteen miles north of Ely.

**WISDOM** usually denotes a higher and more refined notion of things immediately presented to the mind, as it were, by intuition without the assistance of ratiocination.

**WISTON** a market-town of Pembroke-shire, situated ten miles north of Pembroke.

**WIT** is a quality of certain thoughts and expressions: that talent which some men have of inventing ludicrous thoughts or expressions: we say commonly, a witty man or a man of wit.

The image here is undoubtedly witty. It is ludicrous: and it must occasion surprize; for having no natural foundation, it is altogether unexpected.

The other branch of wit in the thought, is that only which is taken notice of by Addison, following Locke, who defines it "to lie in the assemblage of ideas; and putting those together, with quickness and variety, wherein can be found any resemblance or congruity, thereby to make up pleasant pictures and agreeable visions in the fancy." It may be defined more curiously, and perhaps more accurately, "a junction of things by distant and fanciful relations, which surprize because they are unexpected." The following is a proper example.

Shylock. You knew (none so well, none so well as you) of my daughter’s flight.

Salino. That’s certain: I, for my part, knew the tailor that made the wings she flew withal.

**MERCHANT of Venice, act 3, sc. 1.**

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We grant although he had much wit, he was very shy of using it.
WIT (944)

As being loth to wear it out;
And therefore bore it not about,
Unless on holidays, or so,
As men their best apparel do.

Wit is of all the most elegant recreation; the image enters the mind with gaiety, and gives a sudden flash which is extremely pleasant. Wit thereby gently elevates without limiting, raises mirth without dissoluteness, and relaxes while it entertains.

Wit in the expression, commonly called a play of words, being a bithard sort of wit, is referred for the last place. We proceed to examples of wit in the thought; and first of all, being a bithard sort of wit, is referred for the last place.

Falstaff, speaking of his taking Sir John Colevile of the Dale:

Here he is, and here I yield him; and I beseech your Grace, let it be book’d with the rest of this day’s deeds; or, by the Lord, I will have it in a particular ballad elfe, with mine own picture on the top of it, Colevile kibbing my foot: to which cause if I be enforced, if you do not all chew like gilt twopences to me; and I, in the clear sky of fame, o’ershine you as much as the full moon doth the cinders of the element, which flew like pins’ heads to her; believe not the word of the noble. Therefore let me have right, and let defect mount.

Second Part, Henry IV. act 4. sc. 6.

I knew, when seven justices could not take up a quarrel, but when the parties were met themselves, one of them thought but of an if; as, if you had said fo, then I said so: and they shook hands, and swore brothers. Your is the only peace-maker; much virtue is in is.

Shakespeare.

For there is not through all nature another so callous and insensible a member as the world’s posteriors, whether you apply to it the toe or the birch.

Preface to a Tale of a Tub.

The other branch of wit in the thought, viz. ludicrous combinations and oppositions, may be traced through various ramifications. And, first, fanciful cauces are given that have no natural relation to the effects produced:

Lancaster. Fare you well, Falstaff; I, in my condition, Shall better speak of you than you deserve. [Exit.

Falstaff. I would you had but the wit; ’twere better than your dukedom. Good faith, this fame young fober-blooded boy doth not love me; nor a man cannot make him laugh; but that’s no marvel, he drinks no wine. There’s never an of thee demure boys come to any proof; for thin drink doth so overcool their blood, and making many fish-meals, that they fall into a kind of male green-ficknes; and then, when they marry, they get wenches. They are generally fools and cowards; which some of us should be too, but for inflammation. A good sherris-fack hath a twofold operation in it: it ascends me into the brain; dries me there all the foolifh, dull, and crudy vapours which environ it; make it apprehensive, quick, forgetive, full of nimble, fiery, and delectable images; which delivered over to the voice, the tongue, which is the birth, becomes excellent wit. The second property of your excellent therris is, the warming of the blood; which before cold and settled, leat the liver white and pale; which is the badge of pusillanimity and cowardice: but the sherris warms it, and makes it course from the inwards to the parts extreme; it illuminates the face, which, as a beacon, gives warning to all the rest of this little kingdom, man, to arm; and then the vital comoners and inland petty spirits mutter me all to their captain, the heart; who, great, and puff’d up with this retinue, doth any deed of courage; and thence, valour comes of sherris. So that skill in the weapon is nothing without fack, for that fets it a-work; and learning a mere hoard of gold kept by a devil, till sack commences it, and sets it in act and use. Hereof comes it that Prince Harry is valiant; for the cold blood did naturally inherit of his father, he hath, like lean, sterile, and bare land, manured, husbanded, and till’d with excellent endeavour of drinking good and good store of fertile therris, that he is become very hot and valiant. If I had a thousand fans, the first human principle I would teach them, should be to forswear thin potations, and to addict themselves to fack.

Second Part of Henry IV. act 4. sc. 7.

The trenchant blade, toledo truely,
For want of fighting was grown rulry,
And ate into itself, for lack
Of some body to hew and hack.

The peaceful scabbard where it dwelt
The rancour of its edge had felt:
For of the lower end two handful
It had devoured, ’twas so manful;
And so much scorn’d to lurk in cafe,
As if it durst not show its face.

Hudibras, canto 1.

To account for effects by such fantastical causes, being highly ludicrous, is quite improper in any serious composition. Therefore the following passage from Cowley, in his poem on the death of Sir Henry Wooton, is in a bad taste.

He did the utmost bounds of knowledge find,
He found them not so large as was his mind.
But, like the brave Pelian youth, did moan,
Because that art had no more worlds than one.
And when he saw that he through all had past,
He dy’d, left he should idle grow at last.

Fanciful reasoning:

Falstaff. Imbowell’d! — if thou imbowel me to day,
I’ll give you leave to powder me, and eat me to-morrow! S’blood, ’twas time to counterfeit, or that hot temperant Scot had paid me foct and lot too. Counterfeit? I lie, I am no counterfeit: to die is to be a counterfeit; for he is but the counterfeit of a man, who hath not the life of a man; but to counterfeit dying, when a man thereby liveth, is to be no counterfeit, but the true and perfect image of life indeed.

First Part Henry IV. act 1. sc. 10.

Clown. And the more pity that great folk should have contention in this world to drown or hang themselves, more than their even Christians.

Hamlet, act 5. sc. 2.

Pedro. Will you have me, Lady?
Beatrice. No, my Lord, unless I might have another for working days. Your Grace is too costly to wear every day.

Much ado about nothing, Act 2. sc. 5.

Jovina.
**W I T** (955)

*WIT*

Jeff. I shall be saved by my husband; he hath made me a Christian.

Laun. Truly the more to blame he; we were Christians enough before, even as many as could well live by one another: this making of Christians will raise the price of hogs; if we grow all to be pork-eaters, we shall not have a rafter on the coals for money.

*Merchant of Venice, Act 3, sc. 6.*

But Hudibras gave him a twitch,
As quick as lightning, in the breech,
Jilt in the place where honour’s lodg’d,
As wife philosophers have judg’d;
Because a kick in that part, more
Hurst honour, than deep wounds before.

Hudibras, canto 3.

Ludicrous junctures of small things with great, as of equal importance:

This day black omens threat the bright’st fair
That e’er deserv’d a watchful spirit’s care:
Some dire defaster, or by force, or flight:
But what, or where, the fates have wrapt in night:
Whether the nymph shall break Diana’s law;
Or some frail china jar receive a flaw:
Or flain her honour, or her new brocade;
Forget her pray’rs, or miss a masquerade;
Or whether Heav’n has doom’d that Shock must fall.

*Rape of the Lock, canto ii.*

One speaks the glory of the Britifh Queen,
And one describes a charming Indian screen.

*Ibid, canto iii.*

Then flash’d the living lightning from her eyes,
And screams of horror rend th’affrighted skies.
Not louder shrieks to pitying heav’n are cast,
When husbands, or when lapdogs, breathe their last.
Or when rich china vessels fall’n from high,
In glittering dust and painted fragments lie!

*Ibid, canto iii.*

Not youthful kings in battle feiz’d alive,
Not scornful virgins who their charms survive,
Not ardent lovers robb’d of all their bliss,
Not ancient ladies when refus’d a kiss,
Nor tyrants fierce that unrepenting die,
Nor Cynthia when her manteau’s pinn’d awry.
E’er felt fuch rage, refentment, and defpair.

Not ardent lovers robb’d of all their blifs.
Not youthful kings in battle feiz’d alive.
Not scornful virgins who their charms survive.
Not ardent lovers robb’d of all their bliss.
Not ancient ladies when refus’d a kiss.
Nor tyrants fierce that unrepenting die.
Nor Cynthia when her manteau’s pinn’d awry.
E’er felt fuch rage, refentment, and defpair.

As thou, sad virgin! for thy ravish’d hair.

Nor Cynthia when her manteau’s pinn’d awry.
Nor tyrants fierce that unrepenting die.
Not ardent lovers robb’d of all their blifs.
Not youthful kings in battle feiz’d alive.
Not scornful virgins who their charms survive.
Not ardent lovers robb’d of all their bliss.
Not ancient ladies when refus’d a kiss.
Nor tyrants fierce that unrepenting die.
Nor Cynthia when her manteau’s pinn’d awry.
E’er felt fuch rage, refentment, and defpair.

In glittering dust and painced fragments lie!

Or when rich china vefels fall’n from high.
Not louder shrieks to pitying heav’n are cast,
And screams of horror rend th’affnghted skies.
Then flash’d the living lightning from her eyes.

And one describes a charming Indian screen,
One speaks the glory of the Britifh Queen,
Or whether Heav’n has doom’d that Shock must fall.

*Hudibras, part 3, canto 3.*

Here
Here Britain's state men oft the fall foredoom
Of foreign tyrants, and of nymphs at home;
Here thou, great Anna whom three realms obey,
Dost sometimes counsel take—and sometimes tea.

*Rape of the Lock*, canto 3, l. 5.

O'er their quietus where fat judges doze,
And lull their conscience to repose.

*Dispensary*, canto 1.

Speaking of Prince Eugene:
This general is a great taker of snuff as well as of
towns.

*Pope's Key to the Lock*.

Exul menisque donumque.

Metamorphoses, lib. ix. 409.

A seeming opposition from the same cause:
Hic quiescit qui nunquam quievit.

*Waller*.

Program of the Lock, canto 1.

So like the chances are of love and war,
That they alone in this distinguished are;
In love the victors from the vanquish'd fly,
They fly that wound, and they pursue that die.

*Waller*.

What new-found witchcraft was in thee,
With thine own cold to kindle me?
Strange art; like him that should devise
To make a burning glass of ice.

*Cowley*.

Wit of this kind is unsuitable in a serious poem; witness
the following line in Pope's Elegy to the memory of an
unfortunate lady:

Cold is that breast which warm'd the world before.

This sort of writing is finely burlesqued by Swift:

Her hands, the softest ever felt,
Though cold would burn, though dry would melt.

*Strephon and Chloe*.

Taking a word in a different sense from what is meant,
comes under wit, because it occasions some degree of
surprise:

Beatrice. I may sit in a corner, and cry Heigh ho! for
a husband.

Pedro. Lady Beatrice, I will get you one.

Beatrice. I would rather have one of your father's get-
ting. Hath your Grace ne'er a brother like you? Your
father got excellent husbands, if a maid could come by
them.

*Much ado about nothing*, act 2, sc. 5.

Falstaff. My honest lads, I will tell you what I am about.

Pistol. Two yards and more.

Falstaff. No quips now, Pistol: indeed, I am in the
waste; two yards about: but I am now about no waste; I
am about thrift.

*Merry Wives of Windsor*, act 1, sc. 7.

Lo, Sands.—By your leave, sweet ladies,
If I chance to talk a little wild, forgive me:
I had it from my father.

*Anne bullen*. Was he mad, Sir?

Sands. O, very mad, exceeding mad, in love too;
But he would bite none—

*K. Henry VIII*.

An assertion that bears a double meaning, one right, one
wrong, but so connected with other matters as to direct
us to the wrong meaning, is a species of bafard wit which
is distinguished from all others by the name *pun*. For example,

Paris.——Sweet Helen, I must woo you
To help unarm our Hector: his stubborn buckles,
With thee! his white enchanting fingers touch'd,
Shall more obey, than to the edge of steel,
Or force of Greekish fire; thou shalt do more
Than all the island kings, disarm great Hector.

Troilus and Cressida, act 3, sc. 2.

The pun is in the close. The word *disarm* has a double
meaning: it signifies to take off a man's armour, and also
to subdue him in fight. We are directed to the latter tenfe
by the context; but with regard to Helen, the word holds
only true in the former tenfe. We go on with other examples:

Effe nihil dicis quicquid petis, improbe Cinna:
Si nī, Cinna, petis, nī tibi, Cinna, nego.

*Martial*, l. 13, epigr. 61.

Chief Justice. Well! the truth is, Sir John, you live
in great insanity.

Falstaff. He that buckles him in my belt cannot live in
less.

Chief Justice. Your means are very slender, and your
waste is great.

Falstaff. I would it were otherwise: I would my means
were greater, and my waste slenderer.

*Second part Henry IV*, act 1, sc. 5.

Celia. I pray you bear with me, I can go no further.

Clown. For my part, I had rather bear with you than
bear you: yet I should bear no crofs if I did bear you;
for I think you have no money in your purse.

*As you like it*, act 2, sc. 4.

He that imposes an oath makes it,
Not he that for convenience takes it.

Then how can any man be said
To break an oath he never made?

*Hudibras*, part 2, canto 2.

The seventh satire of the first book of Horace is purposely
contrived to introduce at the close a most execrable pun.
Talking of some infamous wretch whose name was *Rex Ru-
pilius*.

Perilius exclamat, Per magnos, Brute, deos te
Oro, qui reges confueris tollere, cur non
Hunc regem jugulas? Operum hoc, mihi crede, tuorum
eft.

Though playing with words is a mark of a mind at ease,
and dispofed to any sort of amusement, we must not thence
conclude that playing with words is always ludicrous.
Words are so intimately connected with thought, that if
the subject be really grave, it will not appear ludicrous even
in this fantastick strain. We are, however, far from recom-
mending it in any serious performance: on the contrary,
the discordance between the thought and expression must
be disagreeable: witness the following specimen.
He hath abandoned his physicians. Madam, under whose practices he hath perfected time with hope; and finds no other advantage in the process, but only the losing of hope by time.

All's well that ends well, all's true.

K. Henry.

My poor kingdom, sick with civil blows!

When that my care could not with-hold thy riots,

What wilt thou do when riot is thy care?

Second part K. Henry IV.

If any one shall observe, that there is a third species of wit, different from those mentioned, consisting in sounds merely, we are willing to give it place. And indeed it must be admitted, that many of Hudibras's double rhymes come under the definition of wit given in the beginning of this article: they are ludicrous, and their singularity occasions some degree of surprize. Swift is not less successful than Butler in this sort of wit; witness the following lines:


A repartee may happen to be witty: but it cannot be considered as a species of wit; because there are many repartees extremely smart, and withal extremely tedious. We give the following example. A certain pugilist Greek, objecting to Anacharsis that he was a Scythian: True, says Anacharsis, my country disgraces me, but you disgrace your country. This fine turn gives surprize; but it is far from being ludicrous.

WITCHCRAFT, a kind of forcery, especially in women, in which it is ridiculously supposed that an old woman, by entering into a contract with the devil, is enabled, in many instances, to change the course of nature; to raise winds; to perform actions that require more than human strength; and to afflict those who offend them with the sharpest pains, &c. In the times of ignorance and superstition, many severe laws were made against witches, by which great numbers of innocent persons, distressed with poverty and age, were brought to a violent death; but these are now happily repealed. See Law, Tit. xxxiii 8.

WITENA MOT. or WITENA-GEMOT, among manufacturers, the threads which the wife men, and was applied to the great council of the nation of latter-days called the parliament.

WITEPSKI, the capital of the palatinate of the same name, in the duchy of Lithuania, in Poland: E. long 20°, N. lat. 53°.

WOLLIN, a town and island of Pomerania, situated in the Baltic sea, at the mouth of the river Oder, subject to the king of Prussia.

WOLODOMIR, the capital of a province of the same name in Russia: E. long. 45° 3', N. lat. 54° 12'.

WOLOGDA, the capital of a province of the same name in Russia, situated on the river Dwina: E. long. 40° 20', N. lat. 59°.

WOLVERHAMPTON, a market-town of Staffordshire, eleven miles south of Stafford.

WOLVES-TEETH, of an horse, are over-grown grinders, the points of which being higher than the rest, prick his tongue and gums in feeding, so as to hinder his chewing. They are seldom met with in any besides young horses; but if they be not daily worn by chewing, they will grow up even to pierce the roof of the mouth.

WOMAN, the female of man. See Homo.

WOMB, See Anatomy, p. 274.

WOOD, a solid substance, wherein the trunks and branches of trees consist. The wood is all that part of a tree included between the bark and the pith. For the structure of the pith, bark, wood, &c. of plants, see Agriculture, p. 40.

WOODBROUGH, a market-town of Suffolk, situated twenty-six miles south-west of Bury.

WOOD COCK, in ornithology. See Scolopax.

WOOD LOUSE, in zoology. See Oniscus.

WOOD-PICKER, in ornithology. See Picus.

WOODSTOCK, a borough-town of Oxfordshire, situated seven miles north of Oxford. It sends two members to parliament.

WO. F., among manufacturers, the threads which the weavers interlace with an instrument called the shuttle. See Cloth.

WOOL, the covering of sheep. See Ovis.

WOOLWICH, a market-town of Kent, situated on the river Thames, six miles east of London.

WORCESTER, the capital city of Worcestershire, situated twenty-seven miles south-west of Wells.
WORKSOP, a market-town of Nottinghamshire, situated twenty-three miles south-east of London. This is the name of a port-town of the United Netherlands, situated on the river Waal, twenty-three miles west of Rotterdam.

WORMS, in geography, an imperial city of Germany, in the circle of Friesland, situated on the Zuyder-see, twenty miles south-west of Utrecht.

WORLD, in language, an articulate sound designed to represent some idea. See Grammar and Language.

WORKSHOP, a market-town of Nottinghamshire, situated twenty miles north of Nottingham.

WORLD, the assemblage of parts which compose the globe of the earth. See Geography, and Astronomy.

WORMS. See Natural History.

WORMS, in medicine. See Medicine, p. 160.

Earth-Worm. See Lumbricus.

Worm, in gunnery, a crew of iron, to be fixed on the end of a rammer, to pull out the wad of a firelock, carbine, or pistol, being the same with the wad-hook, on the one is more proper for small arms, and the other for cannon.

Worm, in chemistry, is a long, winding, pewter pipe, placed in a tub of water, to cool and condense the vapours in the distillation of spirits.

WORMS, in geography, an imperial city of Germany, in the palatinate of the Rhine: E. long. 9° 5', N. lat. 49° 38'.

WORMWOOD, in botany. See Artemisia.

WORSTED, a kind of woolen thread, which, in the spinning, is twisted harder than ordinary. It is chiefly used either woven or knit into stockings, caps, gloves, or the like.

WORSTED, a market-town of Norfolk, situated seven miles north of Norwich.

WOTTON, a market-town of Gloucestershire, situated seventeen miles south of Gloucester.

WOTTON BASSET, a borough-town of Wilts, thirty miles north of Salisbury; which lends two members to parliament.


Wrasse, or Old wife, in ichthyology. See Labrus.

WORD, in language, an articulate sound designed to represent some idea. See Grammar and Language.

Wanstai, a province of China, in Asia, bounded by the provinces of Honan on the west and by the province of Kiang on the north, by the river Hwang, which divides it from the province of Chekiang, on the east.

Wandering Fig: the corolla is funnel-shaped, and divided into five segments; and the receptacle is paleaceous: The calyx of the female consists of two leaves, including two flowers; it has no corolla; the drupa is dry, mucronated, and divided into two segments; and the nucleus has two cells. There are three species, only one of them, viz. the fruticium, or leaff burdock, a native of Britain.

Wanstai, a province of China. See China, p. 643.

WREXHAM, a market-town of Denbighshire, situated twenty-three miles south-east of St. Asaph.

WRINTON, a market-town of Somerfetshire, situated seven miles north of Wells.

WRIST, in anatomy. See Anatomy, p. 179.

WRIT, in law, signifies, in general, the king's precept in writing under seal, issuing from some court, directed to the sheriff, or any other officer, and commanding something to be done in relation to a suit or action, or giving commission to have the same done.

WRITING, the art or act of signifying and conveying our ideas to others, by letters, or characters, visible to the eye. See Composition, Grammar, and Language.

WRONG, in a logical sense. See Error, Falshood, Truth, &c.

WRONG, in a legal sense, the same with injury, or tort.

Wrongous Imprisonment, in Scots law. See Law, Tit. xxxii. 23.

WURTEMBERG, in Germany, is the north part of the circle of Swabia.

WURZBURG, a city of Germany in the circle of Franconia, capital of the bishopric of that name, situated on the river Maine: in E. long. 9° 5', N. lat. 49° 38'.

WY, a river of Wales, which, rising on the confines of Caernarvonshire, and running south-east, divides the counties of Radnor and Brecknock, then crossing Herefordshire it turns south, and falls into the mouth of the Severn at Chepstow.

WYRA (948)
XENSI, a province of China, bounded by the great wall on the north, by the province of Xanfi on the east, by the province of Suchuen on the south, and by Tibet on the west.

XERANTHEMUM, in botany, a genus of the syngeneia polygamia superflua class. The receptacle is paleaceous; the pappus is sectaceous; and the calix is imbricated, and radiated. There are eleven species, none of them natives of Britain.

XEROPHAGIA, in church-history, the eating of dried foods: so the ancient Christians called certain fast-days, on which they eat nothing but bread and salt, and drank only water; sometimes they added pulse, herbs, and fruits. This sort of fasting was observed chiefly in the holy-week, out of devotion, and not by obligation.

XICHU, a city of China, in the province of Huguai: E. long. 112°, N lat. 27°.

XINYAN, a city of Afi, in the province of Laotung: E. long. 120°, N lat. 31°.

XIPHIAS, in ichthyology, a genus belonging to the order of apodes. The upper jaw terminates in a long sword-shaped rostrum; from which it is called the sword-fish; there are no teeth in the mouth; the gill-membrane has eight rays; and the body is somewhat cylindrical. There is but one species, found in the European ocean.

XIPHOIDES, in anatomy. See Anatomy, p. 175.

XYLO.ALOES, or Aloe-wood, in pharmacy. See Aloe.

This drug is distinguished into three sorts, the calambac, the common lignum aloes, and cambourb.

The calambac, or finest aloe-wood, called by authors lignum aloes praestantissimum, and by the Chinese tuk hiang, is the most refined of all the woods we are acquainted with; it is of a light spongy texture, very porous, and its pores so filled up with a soft and fragrant resin, that the whole may be pressed and dinted by the fingers like wax, or moulded about by chewing in the mouth, in the manner of modelling wax. This kind, laid on the fire, melts in great parts like resin, and burns away in a few moments, with a bright flame and perfumed smoke. Its scent, whilst in the mals, is very fragrant and agreeable; and its taste acid and bitterish, but very aromatic and agreeable; it is so variable in its colour, that some have divided it into three kinds, the one variegated with black and purple; the second, with the same black, but with yellowish instead of purple; and the third, yellow alone, like the yolk of an egg; this last is the least esteemed of all, is the same in every respect, except their colour: It is brought from Cochinchina.

The lignum aloes vulgaris is the second in value. This is of a more dense and compact texture, and consequently less refined than the other; there is some of it, however, that is spongy, and has the holes filled up with the right resinous matter; and all of it, when good, has veins of the same resin in it. We meet with it in small fragments, which have been cut and split from larger; these are of a tolerably dense texture in the more solid pieces, and of a dusky brown colour, variegated with resinous black veins. It is in this state very heavy, and less fragrant than in these pieces which shew a multitude of little holes, filled up with the same blackish matter that forms the veins in others. The woody part of these last pieces is somewhat darker than the other, and is not unfrequently purplish, or even blackish. The smell of the common aloe-wood is very agreeable, but not so strongly perfumed as the former. Its taste is somewhat bitter and acrid, but very aromatic. This wood is also brought from Cochinchina, and sometimes from Sumatra.

The cambourb, or, as some write it, camboumb is also called agallochum fylvestre, and lignum aloes mexicanum. It is a light and friable wood, of a dusky and often mottled colour, between a dusky green black, and a deep brown. Its smell is fragrant and agreeable, but much less sweet than that of either of the others; and its taste bitterish, but not so much acrid or aromatic as either of the two former. We meet with this very frequent, and in large logs; these sometimes entire, sometimes only the heart of the tree, the cortical part being separated. This is brought from the island of Timor, and is the aloe-wood used by the cabinet-makers and inlayers.

The Indians use the calambac by way of incense, burning small pieces of it in the temples of their gods, and sometimes their great people burn it in their houses, in times of fasting. It is esteemed a cordial, taken inwardly; and they sometimes give it in disorders of the stomach and bowels, and to destroy worms. A very fragrant oil may be procured from it, by distillation; which is recommended in paralytic cases, from five to sixteen drops. It is at present, however, but little used; and would scarce be met with anywhere in the shops, but that it is in ingredient in some of the old compositions.

XYLO.BALSAMUM, a name which naturalists give to the wood of the tree which yields that precious gum known to the Latins by the name of opobalsamum, and to us by the balm of Gilead. See Balsam.

We have branches of this tree brought us from Cairo: they are very soft, brittle, unequal, and full of knots; their bark reddish without, and greenish within. The xylo-balsamum is reputed good to strengthen the brain and stomach, and to expel poison.

XYLOCASIA, in the materia medica, the same with the calamus ligustica. See Casia.

XYLON, the prickly cotton-tree, in botany, a genus of the triandria monogynia class of plants, the corolla whereof consists of a single petal, divided into five oval, hollow, patent segments; the fruit is a large, oblong, turbinate capsule, formed of five woody valves, and containing five cells; the seeds are roundish, and fixed to a columnar pentangular receptacle, and have a quantity of fine down, or coton, adhering to them.

XYNOECIA, in Grecian antiquity, an anniversary feast, observed by the Athenians, in honour of Minerva, upon the sixteenth of Hecatombaenon, in memory that, by the persuasion of Theseus, they left their country seats, in which they lay dispersed here and there in Attica, and united together in one body.

XYRIS, in botany, a genus of the triandria monogynia class. The corolla consists of three equal crested petals; and the gluma consists of two valves. There is but one species, a native of India.

XYSTARCHA, in antiquity, the master or director of the xylus. In the Greek gymnasium, the xystarcha was the
Y

YACHT, or Yatch, a vessel with one deck, carrying from four to twelve guns. See Ship.

YARD, a measure of length used in Britain and Spain, consisting of three feet, chiefly to measure cloth, stuffs, &c.

YARD, in anatomy. See Anatomy, p. 270.

YARDS of a ship are those long pieces of timber which are made a little tapering at each end, and are fitted athwart its proper mast, with the fails made fast to them, so as to be hoisted up, or lowered down, as occasion serves. They have their names from the masts unto which they belong.

YARD-ARM is that half of the yard that is on either side of the mast. When it lies athwart the ship.

YARDS also denote places belonging to the navy, where the ships of war, &c. are laid up in harbour. There are, belonging to his majesty's navy, six great yards, viz. Chatham, Deptford, Woolwich, Portmouth, Sheerness, and Plymouth: these yards are fitted with several docks, wharfs, lanches, and graving places for the building, repairing, and cleaning of his majesty's ships; and therein are lodged great quantities of timber, masts, planks, anchors, and other materials: there are also convenient store-houses in each yard, in which are laid up vast quantities of cables, rigging, sails, blocks, and all other sorts of stores needful for the royal navy.

YARE, among sailors, implies quick or ready: as, to keep his arms yare; that is, to keep them clean and bright.

YARE, a river of Norfolk, which runs from west to east, through that country, passing by Norwich, and falling into the German sea at Yarmouth.

YARMOUTH, a borough and port town of Norfolk, situated on the German sea, at the mouth of the river Yare, twenty miles east of Norwich. It sends two members to parliament.

YARMOUTH is also a borough-town of the Isle of Wight, in Hampshire, situated on the north-west coast of the island, six miles west of Newport. It sends two members to parliament.

YARN, wool or flax spun into thread, of which they weave cloth. See Cloth.

YARUM, a market-town of the north riding of Yorkshire, situated on the river Tees, thirty miles north of York.

YAWNING, an involuntary opening of the mouth, occasioned by a vapour or ventriloquy endeavouring to escape, and generally witnessing an irksome weariness, or an inclination to sleep. Yawning, according to Boerhaave, is performed by expanding at one and the same time all the muscles capable of spontaneous motion; by greatly extending the lungs; by drawing in gradually and slowly a large quantity of air; and gradually and slowly breathing it out, after it has been retained for some time, and ruffled; and then restoring the muscles to their natural state. Hence the effect of yawning is to move, accelerate, and equally distribute all the humoura through all the vessels of the body, and consequently to qualify the muscles and organs of sensation for their various functions.

Sanctorius observes, that a great deal is insensibly discharged, when nature endeavours to get rid of the retained perspirable matter, by yawning and stretching of the limbs. To these a person is most inclined just after sleep, because, a greater quantity going off by the pores of the skin than at other times, whenever a person wakes, the increased contraction that then happens induces a great deal of the perspirable matter in the cutaneous passages, which will continually give such irritations as excite yawning and stretching; and such motions, by shaking the membranes of the whole body, and shifting the contacts of their fibres, and the inclosed matter, by degrees throw it off. Hence we see the reason why healthful strong people are most inclined to such motions, because they perspire most in time of sleep, and therefore have more of the perspirable matter to lodge in the pores, and greater irritations thereunto.

YAWS, in the sea language. A ship is said to make yaws, when she does not steer steady, but goes in and out when there is a stiff gale.

YAWS, a distemper endemical to Guinea and the hotter climates of Africa. See Medicine, p. 137.

YEAR. See Astronomy, p. 489.

Year and Day in Scots law. See Law, Tit. vi. 21, 22.

YELLOW, one of the original colours of light.

YELLOWS, a disease in a horse, much the same with that called the jaundice in man. See Fæbiery, p. 561.

YELLOWHAMMER, in ornithology. See Fringilla.

YEOMAN, the first or highest degree among the plebeians of England, next in order to the gentry.

The Yeomen are properly freeholders, who having land of their own, live on good husbandry.

Yeoman is also a title of office in the king's house, ld, of a middle place or rank between an usher and a groom.

YEOMAN
Yeomen of the guard were anciently two hundred and fifty men of the belt rank under gentry, and of larger stature than ordinary, each being required to be six feet high.

At present there are but one hundred yeomen in constant duty, and seventy more not in duty; and as any of the hundred dies, his place is supplied out of the seventy.

They go dressed after the manner of king Henry VIII’s time. They formerly had diet as well as wages when in waiting, but this was taken off in the reign of queen Anne.

YEOVIL, a market-town of Somersetshire, situated eighteen miles south of Wells.

YEST, a head or scum rising upon beer or ale, while working or fermenting in the vat. See Brewing.

It is used for a leaven or ferment in the baking of bread, serving to swell or puff it up very considerably in a little time, and to make it much lighter, softer, and more delicate.

YEW, in botany. See Taxus.

YLA, one of the western islands of Scotland, situated in the Irish sea, west of Cantire.

YNCA, an appellation anciently given to the kings of Peru, and the princes of their blood; the word literally signifying lord, king, emperor, and royal blood.

YOAK, or Yoke in agriculture, a frame of wood, fitted over the necks of oxen, whereby they are coupled together, and harnessed to the plough.

Yoak of land in our ancient customs, was the space which a yoke of oxen, that is, two oxen, may plow in one day.

Sea Yoak. When the sea is so rough that the helm cannot be governed by the hands, the seamen make a yoak to steer by; that is, they fix two blocks to the end of the helm, and receiving two small ropes through them, which they call falls, by having some men at each tackle, they govern the helm by direction. They have another way of making a sea yoak, by taking a double turn about the end of the helm with a single rope, the ends being laid to the ship’s sides, by means whereof they guide the helm.

YOANGFU, a city of China, in the province of Huguam, situated on the river Kiai E. long. 114°, N. lat. 30° x 0°.

YOLK, the yellow part in the middle of an egg. See Egg.

YONNE, a river in France, which rising in Burgundy, and running north through Nivernois and Champagne, falls into the Seine at Montereau fur Yonne.

YORK, the capital city of Yorkshire, situated on the river Ouse, 180 miles north of London: W. long. 50°, N. lat. 54°. It is a large city, and has some good buildings in it, particularly the cathedral, which is a Gothic pile, equal to any thing of the kind in England. It is the see of an archbishop, and sends two members to parliament.

New York, one of the British colonies in North America, which comprehending the Jerseys, that frequently have the same governor, is situated between 72° and 74° of W. long. and between 41° and 44° of N. lat. bounded by Canada on the north, New England on the east, the American Sea on the south, and Pennsylvania and the country of the Iroquois on the west.

New York, the capital city of this province, is situated on an island in the mouth of Hudson’s river, in W. lon. 72° 30′, N. lat. 41°.

Yucca, a genus of the hexandria monogyina class. The corolla is open and bell-shaped; it has no stigmas; and the capsule has three cells. There are four species, all natives of America.

A kind of bread is made from the dried root of this plant by the Indians, which much resembles that made from the root of the calandra or scutellaria of Linnaeus.

Zaman

ZAARA, one of the divisions of Africa, situated under the tropic of cancer, is bounded by Bildulgerid on the north, by the unknown parts of Africa on the east, by Nigritia or Negroland on the south, and by the Atlantic ocean on the west. This is a barren desert, and so destitute of water, that the camels which pass over it from Morocco to traffic with Negroland, are half loaded with water and provisions.

ZAFFER, or Zafrs, in chemistry, the name of a blue substance, of the hardness and form of a stone; and generally suppos’d to be a native sapphire.

It is in reality, however, a preparation of cobalt; the calx of that mineral being mixed with powdered flints and wetted with water to bring it into this form.

ZAMORA, a city of Spain, in the province of Leon, situated on the river Douro, thirty-two miles north of Salamanca: W. long. 6°, N. lat. 41° 30′.

Vol. III. No. 100.
ZANTE, an island in the Mediterranean sea, situated E. long. 21° 30', N. lat. 37° 50', being about twenty four miles long, and twelve broad. The chief town is Zante, and is situated on the east side of the island, being well fortified and defended by a castle.

ZAPATA, a kind of feast or ceremony held in Italy, in the courts of certain princes, on St Nicholas's day; wherein people hide presents in the shoes or flippers of thefe who would do honour to, in such a manner as may surprife them on the morrow when they come to dress; being done in imitation of the practice of St Nicholas, who used in the night-time to throw purses of money into the windows, to marry poor maids withal.

ZARA, a city of Dalmatia, situated on the gulf of Venice: E. long. 17°, N. lat. 44°.

ZARNAW, a city of Poland, in the province of Little Poland and palatinate of Sandomir, situated E. long. 20°, N lat. 51° 30'.

ZEA, INDIAN CORN, in botany, a genus of the monoecia triandria clas. The calyx of the male is a double flowered glume, without any awn; the corolla is likewise a glume, without any awn; the calyx and corolla of the male consists each of two valves; the stylus is filiform, and pendulous; and the seeds are oblong, being sunk in an oblong receptacle. There is but one species, a native of America.

ZEAL, the exercise of a warm animated affection, or passion, for anything.

ZELAND, the chief of the Danish islands, is situated at the entrance of the Baltic sea, bounded by the Schagger-rac-eea. on the north, by the Sound, which separates it from Schonen, on the east; by the Baltic sea, on the south; and by the Strait called the Great Belt, which separates it from the island of Funen, on the west; being of a round figure, near two hundred miles in circumference; the chief town is Copenhagen.

ZELAND, is also a province of the United Netherlands, consisting of eight islands, which lie in the mouth of the river Scheld, bounded by the province of Holland, from which they are separated by a narrow channel, on the north; by Brabant, on the east; by Flanders, from which they are separated by one of the branches of the Scheld, on the south; and by the German ocean, on the west.

ZEALOTS, an ancient sect of the Jews, so called from their pretended zeal for God's law, and the honour of religion.

ZEBRA, in zoology. See Equus.

ZECHARIAH, a canonical book of the Old Testament, containing the predictions of Zechariah, the son of Barachia, and grandson of Ileod. He is the eleventh of the twelve lesser prophets. Zechariah entered upon the prophetic office at the same time with Haggai, and was sent to the Jews upon the same message, to reprove them for their backwardness in erecting the temple, and restoring divine worship; but especially for the disorder of their lives and manners, which could not but derive a curse upon them. By several notable visions and types, he endeavours to confirm their faith, and establish their assurances concerning God's providence with them, and care over them; and as a proof and demonstration of this, he interposes the most comfortable promises of the coming of the kingdom, the temple, the priesthood, the victory, the glory of Christ the Branch. Nor does he for-get to assure them of the ruin of Babylon, their most implacable enemy. This prophet is the longest and most obscure of all the lesser prophets, his style being interrupted and without connexion.

ZEDOARY, in the materia medica, a root, the several pieces of which differ so much from one another in shape, that they have been divided into two kinds, as if two different things, under the names of the long and round zedoary, being only the several parts of the same root.

Zedoary is to be chosen fresh, round, and hard, in large pieces; it matters not as to shape, whether long or round; of a smooth surface, and of a sort of fatty appearance within, too hard to be bitten by the teeth, and of the briskeft smell that may be; such as is friable, dulky, and worm eaten, is to be rejected.

Zedoary, both of the long and round kind, is brought us from China; and we find by the Arabs, that they also had it from the same place. The round tubers are less frequent than the long, and some of them have therefore supposed them the produce of a different and more rare plant; but this is not so probable as that the general form of the root is long, and the round tubers are only lafos nature, and less frequent in it.

Zedoary, distilled with common water, affords a thick and dense effential oil, which soon concretes of itself into a kind of camphor, and on this oil Its virtues principally depend. It is a sudorific, and is much recommended by some in fevers, especially of the malignant kinds. It is also given with success as an expectorant in all disorders of the breast, arising from a tough phlegm, which it powerfully incides and attenuates; it is also good against flatulences, and in the cholick; it strengthens the thorax, and afflicts digestion; and, finally, is given with success in nervous cases of all kinds.

ZELL, a city of Germany, in the circle of Lower Saxony, capital of the duchies of Zell and Lunenburg, situated at the confluence of the rivers Aller and Fulhe, thirty miles north of Hanover, and forty south of Lunenburg: E. long. 10°, N. lat 52° 52'.

ZEND, or ZENDAVESTA, a book containing the religion of the Magians, or worshippers of fire, who were disciples of the famous Zoroaster. See Magi.

This book was composed by Zoroaster during his retirement in a cave, and contained all the pretended revelations of that impostor. The first part contains the liturgy of the magi, which is used among them in all their oratories and fire-temples to this day; they reverence it as the Chriftians do the Bible, and the Mahometans the Koran. There are found many things in the zend taken out of the scriptures of the Old Testament, which Dr. Prideaux thinks is an argument that Zoroaster was originally a Jew. Great part of the Psalms of David are infected: he makes Adam and Eve to have been the first parents of mankind, and gives the fame history of the creation and deluge as Moses does, and commands the same observances about clean and unclean beasts, the same law of paying tythes to the sacerdotal order, with many other institutions of Jewish extraction. The rest of its contents are an historical account of the life, actions, and prophecies of its author, with rules and exhortations to moral living. The Mahometans have a feast which they call Zendikites, who are said to be the Sadducees of Mahometanism, denying providence and the resurrection, believing
ZEPHANIAH, a canonical book of the Old Testament, containing the prophecies of Zephaniah the son of Cushi, and grandson of Gedaliah; being the ninth of the twelve minor prophets. He prophesied in the time of king Josiah, a little after the captivity of the ten tribes, and before that of Judah; so that he was co-temporary with Jeremiah. He freely publishes to the Jews, that what increased the divine wrath against them, was their contempt of God's service, their apostasy, their treachery, their idolatry, their violence and rapine, and other enormities: such high provocations as these rendered their destruction terrible, universal, and unavoidable: and then, as most of the prophets do, he minglest extortions with repentance, as the only expedient in these circumstances.

ZEPHYR, the west wind, or that which blows from the west.

ZEST, the woody thick skin, quartering the kernel of a walnut; prescribed by some physicians, when dried and taken with white-wine, as a remedy against the gravel.

ZETETIC method, in mathematics, the method made use of to investigate or solve a problem.

ZEUGMA, a figure in grammar, whereby an adjective or verb which agrees with a nearer word, is also, by way of supplement, referred to another more remote.

ZEUS, in ichthyology, a genus belonging to the family of the salmonid. The male has no calyx; the corolla consists of a double-valved glume without any awn. The female has no calyx; the corolla consists of a single-valved gama with an awn; the filus is bifid; and there is but one seed. The species are two, none of them natives of Britain.

ZEBRETICUS, in zoology. See Castor.

ZINGIBER, in botany. See Amomum.

ZINK. See Chemistry, p. 80, 106, 143.

ZINZIBER, or Zingiber, Ginger, in botany, the naked flaked oval spitted amomum. See Amomum, and Ginger.

ZIRANIA, in botany a genus of the monocca hexanaria class. The male has no calyx; the corolla consists of a double-valved glume without any awn. The female has no calyx; the corolla consists of a single-valved gama with an awn; the filus is bifid; and there is but one seed. The species are two, none of them natives of Britain.

ZIZIPHORA, in botany, a genus of the diandria monogymina class. The corolla consists of five leaves; and the corolla of five petals; the nectarium consists of ten leaves, covering the germen, and the capsule has five cells. There are 8 species, none of them natives of Britain.

ZODIAC, in astronomy, a fascia or broad circle, whose middle is the ecliptic, and its extremes two circles parallel thereto; at such a distance from it as to blend or comprehend the excursions of the sun and planets. See Astronomy.
### CORRIGENDA.

Page 132. col. 1. l. 25, 26. Instead of from the salivary glands, from smoking, &c. read, as to the salivary glands from smoking, &c.

P. 510. col. 2. l. 1. For (ibid. no 2.) read (Plate CXLVII. fig. 1. n° 1.)

### NOTA N D A.

1. In the Table of Errata at the end of Vol. I. it was said, "That Plate XLVII. represented a different Orrery from the one described." This was a mistake the Printer was somehow led into: for the Orrery there represented is the right one, and corresponds with the description.

2. In FLAX-DRressing, plans of two machines relating to that article were referred to, but which several circumstances now render it difficult for the Editors to give. It is therefore hoped these will be dispensed with, as they are not of the most general importance, and the article is sufficiently explained and illustrated without them; and especially as ten plates more than the proposed number, and 16 pages of letter-press, are given gratis.

### DIRECTIONS to the BINDER.

1. Be careful in cutting the book, not to pare too much off the margin; as it was necessary, in several places, particularly in BOOK-KEEPING, to enlarge the page beyond the measure of the rest of the book.

2. Title-pages for the Three Volumes are printed. Place them respectively at the beginning of the Volume; and after the title in Vol. I. insert the Preface.

3. In BOOK-KEEPING, Vol. I. cancel pages 585, 586; and in their place insert the leaves marked with an asterisk and enclosed with parentheses, viz. (*585) (*586), (*A) (*A), (*B) (*B), (*C) (*C), (*D) (*D), (*E) (*E).

4. Insert the Plates as directed below.

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