EVERETT
ON THE
IMPORTANCE
OF
SCIENTIFIC KNOWLEDGE

A

DISCOURSE

ON THE

IMPORTANCE TO PRACTICAL MEN

OF

SCIENTIFIC KNOWLEDGE,

AND ON THE

ENCOURAGEMENTS TO ITS PURSUIT.

BY

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A

DISCOURSE, &c.*

THE object of the Mechanics' Institute is, to diffuse useful knowledge among the mechanic class of the community. It aims, in general, to improve and inform the minds of its members; and particularly to illustrate and explain the principles of the various arts of life, and render them familiar to that portion of the community, who are to exercise these arts as their occupation in society. It is also a proper object of the Institute, to point out the connection between the mechanic arts and the other pursuits and occupations, and show the foundations, which exist in our very nature, for a cordial union between them all.

These objects recommend themselves strongly and obviously to general approbation. While the cultivation of the mind, in its more general sense, and in connection with morals, is as important to mechanics as to any other class of the community, nothing is plainer than that those whose livelihood depends on the skilful practice of the arts, ought to be instructed, as far as possible, in the scientific principles and natural laws, on which the arts are founded. This is necessary, in order

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that the arts themselves should be pursued to the greatest advantage; that popular errors should be eradicated; that every accidental improvement in the processes of industry, which offers itself, should be readily taken up and pursued to its principle; that false notions, leading to waste of time and labour, should be prevented from gaining or retaining currency; in short, that the useful, like the ornamental arts of life, should be carried to the point of attainable perfection.

The history of the progress of the human mind shows us, that for want of a diffusion of scientific knowledge among practical men, great evils have resulted, both to science and practice. Before the invention of the art of printing, the means of acquiring and circulating knowledge were few and ineffectual. The philosopher was, in consequence, exclusively a man of study, who, by living in a monastic seclusion, and by delving into the few books which time had spared,—particularly the works of Aristotle and his commentators,—succeeded in mastering the learning of the day; learning, mostly of an abstract and metaphysical nature. Thus, living in a world not of practice, but speculation, never bringing his theories to the test of observation, his studies assumed a visionary character. Hence the projects for the transmutation of metals; a notion not originating in any observation of the qualities of the different kinds of metals, but in reasoning, *a priori*, on their supposed identity of substance. So deep-rooted was this delusion, that a great part of the natural science of the middle ages consisted in projects to convert the baser metals into gold. It is plain, that such a project would no more have been countenanced, by intelligent, well-informed persons, practically conversant with the nature of the metals, than a project to transmute pine into oak, or fish into flesh.

In like manner, by giving science wholly up to the philosophers, and making the practical arts of life merely a matter of traditionary repetition from one generation to another of uninformed artisans, much evil of an opposite kind was occasioned. Accident, of course,

could be the only source of improvement; and for want of acquaintance with the leading principles of mechanical philosophy, the chances were indefinitely multiplied against these accidental improvements. For want of the diffusion of information among practical men, the principles prevailing in an art in one place were unknown in other places; and processes existing at one period were liable to be forgotten in the lapse of time. Secrets and mysteries, easily kept in such a state of things, and cherished by their possessor as a source of monopoly, were so common, that *mystery* is still occasionally used as synonymous with *trade*. This also contributed to the loss of arts once brought to perfection, such as that of staining glass, as practised in the middle ages. Complicated machinery was out of the question; for it requires, for its invention and improvement, the union of scientific knowledge and practical skill. The mariner was left to creep along the coast, while the astronomer was casting nativities; and the miner was reduced to the most laborious and purely mechanical processes, to extract the precious metals from the ores that really contained them, while the chemist, who ought to have taught him the method of amalgamation, could find no use for mercury, but as a menstruum, by which baser metals could be turned into gold.

At the present day, this state of things is certainly changed. A variety of popular treatises and works of reference have made the great principles of natural science generally accessible. It certainly is in the power of almost every one, by pains and time properly bestowed, to acquire a decent knowledge of every branch of practical philosophy. But still, it would appear, that, even now, this part of education is not on the right footing. Generally speaking, even now, all actual instruction in the principles of natural science is confined to the colleges; and the colleges are, for the most part, frequented only by those intended for professional life. The elementary knowledge of science, which is communicated at the colleges, is indeed useful in any and every calling; but it does not seem right, that none but

those intended for the pulpit, the bar, or the profession of medicine, should receive instruction in those principles, which regulate the operation of the mechanical powers, and lie at the foundation of complicated machinery; which relate to the navigation of the seas, the smelting and refining of metals, the composition and improvement of soils, the reduction to a uniform whiteness of the vegetable fibre, the mixture and application of colours, the motion and pressure of fluids in large masses, the nature of light and heat, the laws of magnetism, electricity, and galvanism. It would seem, that this kind of knowledge was more immediately requisite for those who are to construct or make use of labour-saving machinery, who are to traverse the ocean, to lay out and direct the excavation of canals, to build steam-engines and hydraulic presses, to work mines, and to conduct large agricultural and manufacturing establishments. Hitherto, with some partial exceptions, little has been done, systematically, to afford to those engaged in these pursuits, that knowledge, which, however convenient to others, would seem essential to them. There has been scarce any thing, which could be called education for practical life; and those persons, who, in the pursuit of any of the useful arts, have signalized themselves, by the employment of scientific principles, for the invention of new processes, or the improvement of the old, have been self-educated men.

I am aware, that it is often made an argument against scientific education, that the greatest discoveries and inventions have been either the production of such self-educated men, or have been struck out by accident. There certainly is some truth in this. So long as no regular system of scientific education for the working classes exists, it is a matter of necessity, that, if any great improvement be made, it must be either the result of accident, or the happy thought of some powerful native genius, which forces its way without education, to the most astonishing results. This, however, is no more the case, with respect to the useful arts and the mechanical pursuits, than with respect to all the other occupations

of society; and it would continue to be the case, after the establishment of the best system of scientific education. We find, in every pursuit and calling, some instances of remarkable men, who, without an early education adapted to the object, have raised themselves to great eminence. Lord Chancellor King, in England, was a grocer at that period of life, which is commonly spent in academical study, by those destined for the profession of the law. Chief Justice Pratt, of New York, having been brought up a carpenter, was led, by a severe cut from an axe, which unfitted him for work, to turn his attention to the law. Franklin, who seemed equally to excel in the conduct of the business of life, in the sublimest studies of philosophy, and in the management of the most difficult state affairs, was bred a printer. All these callings are quite respectable, but no one would think of choosing either of them as the school of the lawyer, judge, or statesman. The fact, that the native power of genius sometimes forces its way against all obstacles, and under every discouragement, proves nothing as to the course which it is expedient for the generality of men to pursue. The safe path to excellence and success, in every calling, is that of appropriate preliminary education, diligent application to learn the art, and assiduity in practising it. And I can perceive no reason, why this course should not be followed, in reference to the mechanical, as well as the professional callings. The instances of eminent men, like those named, and many others that might be named, such as Arkwright and Harrison, who have sprung from the depths of poverty to astonish and benefit mankind, no more prove that education is useless to the mechanic, than the corresponding examples prove, that it is useless to the statesman, jurist, or divine.

Besides, it will perhaps be found, that the great men, like those I have named, instead of being instances to show that education is useless, prove only, that, occasionally, men, who commence their education late, are as successful as those who commence it early. This shows, not that an early education is no benefit, but

that the want of it may sometimes be made up in later years. It might be so made up, no doubt, oftener than it is; and it is, in this country, much more frequently than in any other.

The foundation of a great improvement is also often a single conception, which suggests itself occasionally to strong and uneducated minds; and who have the good fortune, afterwards, to receive from others that aid, in executing their projects, without which the most promising conception might have perished undeveloped. Thus Sir Richard Arkwright was without education, but endowed with a wonderful quickness of mind. What particular circumstances awakened his mechanical taste, we are not told. There is some reason to think, that this, like other strongly marked aptitudes, may partly depend on the peculiar organization of the body, which is exactly the same in no two men. The daily observation of the operation of the spinning-wheel, in the cottages of the peasantry of Lancashire, gave him a full knowledge of the existing state of the art, which it was his good fortune to improve to a degree which is even yet the wonder of the world. He conceived, at length, the idea of an improved machine for spinning. And in this conception,—not improbably a flash across the mind, the work of an instant,—lay all his original merit. But this is every thing. America was discovered from the moment that Columbus firmly grasped the idea that, the earth being spherical, the Indies might be reached by sailing on a westerly course. If the actual discovery had not been made for ages after the death of Columbus, he would, nevertheless, in publishing this idea to the world, have been the pilot that led the way, whoever had followed his guidance. Sir Richard Arkwright, having formed the conception of his spinning machine, had recourse to a watchmaker to execute his idea. But how rarely could it happen, that circumstances would put it in the power of a person, ignorant, and poor, to engage the co-operation of an intelligent watchmaker!

Neither is it intended, that the education which we

recommend, should extend to a minute acquaintance with the practical application of science to the details of every art. This would be impossible, and does not belong to preparatory education. We wish only that the general laws and principles should be so taught, as greatly to multiply the number of persons competent to carry forward such casual suggestions of improvement as may present themselves, and to bring their art to that state of increasing excellence, which all arts reach by long-continued, intelligent cultivation.

It may further be observed, with respect to those great discoveries which seem to be produced by happy accidents and fortuitous suggestion, that such happy accidents are most likely to fall in the way of those, who are on the look-out for them,—those whose mental eye-sight has been awakened and practised to behold them. The world is informed of all the cases in which such fortunate accidents have led to useful and brilliant results; but their number would probably appear smaller than it is now supposed to be, were such a thing possible as the *negative history* of discovery and improvement. No one can tell us what might have been done, had every opportunity been faithfully improved, every suggestion sagaciously caught up and followed out. No one can tell how often the uneducated or unobservant mind has approached to the very verge of a great discovery,—has had some wonderful invention almost thrust upon it,—but without effect. The ancients, as we learn from many passages in the Greek and Latin classics, were acquainted with convex lenses, but did not apply them to the construction of magnifying glasses or telescopes. They made use of seal-rings with inscriptions; and they marked their flocks with brands, containing the owner's name. In each of these practices, faint rudiments of the art of printing are concealed. Cicero, in one of his moral works, *(De Natura Deorum,)* in confuting the error of those philosophers, who taught that the world was produced by the fortuitous concourse of wandering atoms, uses the following language, as curious, in connection with the point I would illustrate, as it is

beautiful in expression, and powerful in argument:— 'Here,' says he, 'must I not wonder, if there should be a man who can persuade himself, that certain solid and separate bodies are borne about by force or weight, and that this most beautiful and finished world is formed by their accidental meeting? Whoever can think this possible, I do not see why he cannot also believe that, if a large number of *forms* of the one and twenty letters (of gold or any like substance) were thrown any where together, that the annals of Ennius might be made out from them, as they are cast on the ground, so as to be read in order; a thing which I know not if it be within the power of chance to effect, even in a single verse.' How very near an approach is made, in this remark, to the invention of the art of printing, fifteen hundred years before it took place?

How slight and familiar was the occurrence which gave to Sir Isaac Newton the first suggestion of his system of the universe! This great man had been driven by the plague from London to the country, and had left his library behind him. Obliged to find occupation in the activity of his own mind, he was led, in his meditations, to trace the extent of the principle which occasioned the fall of an apple from the tree, in the garden where he passed his solitary hours. Commencing with this familiar hint, he followed it out to that universal law of gravity, which binds the parts of the earth and ocean together, which draws the moon to the earth, the satellites to the planets, the planets to the sun, and the sun itself, with its attendant worlds, toward some grand and general point of attraction for that infinity of systems, of which the several stars are the centres. How many hundreds of thousands of men, since the creation of the world, had seen an apple falling from a tree! How many philosophers had speculated profoundly, on the system of the universe! But it required the talent of a man, placed by general consent at the head of the human race, to deduce from this familiar occurrence, on the surface of the earth, the operation of the primordial law of nature which governs the movements of the

heavens, and holds the universe together. Nothing less than his sagacity could have made the deduction, and nothing less than a mathematical skill, and an acquaintance with the previously ascertained principles of science,—such as falls to the lot of very few,—would have enabled Newton to demonstrate the truth of his system.

Let us quote another example, to show that the most obvious and familiar facts may be noticed for ages without effect, till they are observed by a sagacious eye, and scrutinized with patience and perseverance. The appearance of lightning in the clouds is as old as creation; and certainly no natural phenomenon forces itself more directly on the notice of men. The existence of the electric fluid, as excited by artificial means, was familiarly known to philosophers a hundred years before Franklin; and there are a few vague hints, prior to his time, that lightning is an electrical appearance. But it was left for Franklin distinctly to conceive that proposition, and to institute an experiment by which it should be demonstrated. The process, by which he reached this great conclusion, is worth remembering. Dr. Franklin had seen the most familiar electrical experiments performed at Boston, in 1745, by a certain Dr. Spence, a Scotch lecturer. His curiosity was excited by witnessing these experiments, and he purchased the whole of Dr. Spence's apparatus, and repeated the experiments at Philadelphia. Pursuing his researches with his own instruments, and others which had been liberally presented to the province of Pennsylvania, by the proprietor, Mr. Penn, and by Dr. Franklin's friend, Mr. Collinson, our illustrious countryman rapidly enlarged the bounds of electrical science, and soon arrived at the undoubting conviction, that the electrical fluid and lightning are identical. But he could not rest till he had brought this truth to the test of demonstration, and he boldly set about an experiment, upon the most terrific element in nature. He at first proposed, by means of a spire, which was erecting in Philadelphia, to form a connection between the region of the clouds and an electrical apparatus; but the appearance

of a *boy's kite* in the air, suggested to him a readier method. Having prepared a kite adapted for the purpose, he went out into a field, accompanied by his son, to whom alone he had imparted his design. The kite was raised, having a key attached to the lower end of the cord, and being insulated by means of a silken thread, by which it was fastened to a post. A heavy cloud, apparently charged with lightning, passed over the kite; but no signs of electricity were witnessed in the apparatus. Franklin was beginning to despair, when he saw the loose fibres bristling from the hempen cord. He immediately presented his knuckle to the key, and received the electrical spark. Overcome by his feelings, at the consummation of this great discovery, "he heaved a deep sigh, and, conscious of an immortal name, felt that he could have been content, had that moment been his last." How easily it might have been his last, was shown by the fact, that when Professor Richman, a few months afterwards, was repeating this experiment at St. Petersburgh, a globe of fire flashed from the conducting rod to his forehead, and killed him on the spot.

Brilliant as Dr. Franklin's discoveries in electricity were, and much as he advanced the science by his sagacious experiments and unwearied investigations, a rich harvest of farther discoveries was left by him to the succeeding age. The most extraordinary of these is the discovery of a modification of electricity, which bears the name of the philosopher by whom it was made known to the world;—I refer, of course, to galvanism. Lewis Galvani was an anatomist in Bologna. On a table in his study, lay some frogs, which had been prepared for a broth for his wife, who was ill. An electrical machine stood on the table. A student of Galvani accidentally touched the nerve on the inside of the leg of one of the frogs, and convulsions immediately took place in the body of the animal. Galvani himself was not present at the moment, but this curious circumstance caught the attention of his wife,—a lady of education and talent,—who ascribed it to some influence of the

electrical machine. She informed her husband of what had happened, and it was his opinion also, that the electrical machine was the origin of the convulsions. A long-continued and patient course of investigation corrected this error, and established the science of galvanic electricity, nearly as it now exists; and which has proved, in the hands of Sir Humphrey Davy, the agent of the most brilliant and astonishing discoveries. Frogs have been a common article of food in Europe for ages; but it was only when they were brought by accident into the study of the anatomist, and fell beneath the notice of a sagacious eye, that they became the occasion of this brilliant discovery.

In all these examples, we see that, whatever be the first origin of a great discovery or improvement, science and study are required to perfect and illustrate it. The want of a knowledge of the principles of science has often led men to waste much time on pursuits, which a better acquaintance with those principles would have taught them were hopeless. The patent office, in every country where such an institution exists, contains, perhaps, as many machines, which show the want, as the possession, of sound scientific knowledge. Besides unsuccessful essays at machinery, holding forth a promise of feasibility, no little ingenuity, and much time and money, have been lavished on a project, which seems, in modern times, to supply the place of the philosopher's stone of the alchemists;—I mean a contrivance for perpetual motion; a contrivance inconsistent with the law of gravity. A familiar acquaintance with the principles of science is useful, not only to guide the mind to the discovery of what is true and practical, but to protect it from the delusions of an excited imagination, ready to waste itself, in the ardour of youth, enterprise, and conscious ingenuity, on that which the laws of Nature herself have made unattainable.

Such are some of the considerations, which show the general utility of scientific education, for those engaged in the mechanical arts. Let us now advert to some of the circumstances, which ought, particularly in the

United States of America, to act as encouragements to the young men of the country to apply themselves earnestly, and, as far as it can be done, systematically, to the attainment of such an education.

1. And, first, it is beyond all question, that what are called the mechanical trades of this country are on a much more liberal footing than they are in Europe. This circumstance not only ought to encourage those who pursue them, to take an honest pride in improvement, but it makes it their incumbent duty to do so. In almost every country of Europe, various restraints are imposed on the mechanics, which almost amount to slavery. A good deal of censure has been lately thrown on the journeymen printers of Paris, for entering into combinations not to work for their employers, and for breaking up the power-presses, which were used by the great employing printers. I certainly shall not undertake to justify any acts of illegal violence, and the destruction of property. But when you consider, that no man can be a master printer in France without a license, and that only eighty licenses were granted in Paris, it is by no means wonderful that the journeymen, forbidden by law to set up for themselves, and prevented by the power-presses from getting work from others, should be disposed, after having carried through one revolution for the government, to undertake another for themselves. Of what consequence is it to a man, forbidden by the law to work for his living, whether Charles X. or Louis Philip is king?

In England, it is exceedingly difficult for a mechanic to obtain a settlement, in any town except that in which he was born, or where he served his apprenticeship. The object of imposing these restrictions is, of course, to enforce on each parish the maintenance of its native poor; and the resort of mechanics from place to place, is permitted only on conditions with which many of them are unable to comply. The consequence is, they are obliged to stay where they were born; where, perhaps, there are already more hands than can find work; and, from the decline of the place, even

the established artisans want employment. Chained to such a spot, where chance and necessity have bound him, the young man feels himself but half free. He is thwarted in his choice of a pursuit for life, and obliged to take up with an employment against his preference, because there is no opening in any other. He is depressed in his own estimation, because he finds himself unprotected in society. The least evil likely to befall him is, that he drags along a discouraged and unproductive existence. He more naturally falls into dissipation and vice, or enlists in the army or navy; while the place of his nativity is gradually becoming a decayed, and finally a rotten burgh, and, as such, enables some rich nobleman to send two members to parliament, to make laws against combinations of workmen.

In other countries, singular institutions exist, imposing oppressive burdens on the mechanical classes. I refer now more particularly to the corporations, guilds, or crafts, as they are called, that is, to the companies formed by the members of a particular trade. These exist, with great privileges, in every part of Europe; in Germany, there are some features in the institution, as it seems to me, peculiarly oppressive. The different crafts in that country are incorporations recognised by law, governed by usages of great antiquity, with funds to defray the corporate expenses, and in each considerable town, a house of entertainment is selected, as the house of call, (or harbour, as it is styled,) of each particular craft. No one is allowed to set up as a master workman, in any trade, unless he is admitted as a freeman or member of the craft; and such is the stationary condition of most parts of Germany, that I understand that no person is admitted as a master workman, in any trade, except to supply the place of some one deceased or retired from business. When such a vacancy occurs, all those desirous of being permitted to fill it, present a piece of work, which is called their master-piece, being offered to obtain the place of a master workman. Nominally, the best workman gets the place; but you will easily conceive, that, in reality, some kind of fa-

vouritism must generally decide it. Thus is every man obliged to submit to all the chances of a popular election, whether he shall be allowed to work for his bread; and that, too, in a country where the people are not permitted to have any ageney in choosing their rulers. But the restraints on journeymen, in that country, are still more oppressive. As soon as the years of apprentieeship have expired, the young mechanic is obliged, in the phrase of the country, to *wander* for three years. For this purpose he is furnished by the master of the craft in which he has served his apprentieeship, with a duly authenticated wandering book, with which he goes forth to seek employment. In whatever city he arrives, on presenting himself, with this credential, at the house of call, or harbour, of the craft in which he has served his time, he is allowed, gratis, a day's food and a night's lodging. If he wishes to get employment in that place, he is assisted in procuring it. If he does not wish to, or fails in the attempt, he must pursue his wandering; and this lasts for three years, before he can be any where admitted as a master. I have heard it argued, that this system had the advantage of circulating knowledge from place to place, and imparting to the young artisan the fruits of travel and intercourse with the world. But however beneficial travelling may be, when undertaken by those who have the taste and capacity to profit by it, I cannot but think, that to compel every young man, who has just served out his time, to leave his home, in the manner I have described, must bring his habits and morals into peril, and be regarded rather as a hardship than as an advantage. There is no sanctuary of virtue like home.

You will see, from these few hints, the nature of some of the restraints and oppressions to which the mechanical industry of Europe is subjected. Wherever governments and corporations thus interfere with private industry, the spring of personal enterprise is unbent. Men are depressed with a consciousness of living under control. They cease to feel a responsibility for them-

selves, and, encountering obstacles whenever they step from the beaten path, they give up improvement as hopeless. I need not, in the presence of this audience, remark on the total difference of things in America. We are apt to think, that the only thing in which we have improved on other countries, is our political constitution, whereby we choose our rulers, instead of recognising their hereditary right. But a much more important difference between us and foreign countries is wrought into the very texture of our society; it is that generally pervading freedom from restraint, in matters like those I have just specified. In England, it is said that forty days' undisturbed residence in a parish gives a journeyman mechanic a settlement, and consequently entitles him, should he need it, to support from the poor-rates of that parish. To obviate this effect, the magistrates are on the alert, and instantly expel a new comer from their limits, who does not possess means of giving security, such as few young mechanics command. A duress like this, environing the young man, on his entrance into life, upon every side, and condemning him to imprisonment for life on the spot where he was born, converts the government of the country,—whatever be its name,—into a despotism.

2. There is another consideration, which invites the artisans of this country to improve their minds; it is the vastly wider field which is opened to them, as the citizens of a new country; and the proportionate call which exists for labour and enterprise in every department. In the old world, society is full. In every country, but England, it has long been full. It was in that country not less crowded, till the vast improvements in machinery and manufacturing industry were made, which have rendered it, in reference to manufactures and commerce,—what ours is, still more remarkably, in every thing,—a new country,—a country of urgent and expansive demand, where new branches of employment are constantly opening, new kinds of talent called for, new arts struck out, and more hands employed in all the old ones. In different parts of our country,

the demand is of a different kind, but it is active and stirring everywhere.

It may not be without use to consider the various causes of this enlargement of the field of action, in this country.

The first, and perhaps the main cause, is the great abundance of good land, which lies open, on the easiest conditions, to every man who wishes to avail himself of it. One dollar and twenty-five cents will enable any man to purchase an acre of first-rate land. This circumstance alone acts like a safety-valve to the great social steam-engine. There can be no very great pressure any where in a community, where, by travelling a few miles into the interior, a man can buy an acre of land for a day's work. This was the first stimulus applied to the condition of things in this country, after the revolutionary war, and it is still operating in full force.

The next powerful spring to our industry was felt in the navigating interest. This languished greatly under the old confederation, being crushed by foreign competition. The adoption of the constitution breathed the breath of life into it. By the duty on foreign tonnage, and by the confinement of the privilege of an American vessel to an American built ship, our commercial marine sprang into existence with the rapidity of magic, and,—under a peculiar state of things in Europe,—appropriated to itself the carrying trade of the world.

Shortly after this stimulus was applied to the industry of the Northern and Middle States, the Southern States acquired an equally prolific source of wealth, unexpected and rapid beyond example in its operation;—I mean the cultivation of cotton. In 1789, the hope was expressed by southern members of congress, that, if good seed could be procured, cotton might be raised in the Southern States, where, before that time, and for several years after, not a pound had been raised for exportation. The culture of this beautiful staple was encouraged by a duty of three cents a pound on imported cotton; but it languished for some time, on account of the difficulty of separating the seed from the fibre.

At length, Eli Whitney, of Connecticut, invented the saw-gin; and so prodigiously has this culture increased, that it is calculated that the cotton crop of last year amounted to one million of bales, of at least three hundred pounds each.

In 1807, the first successful essays were made with steam navigation. The progress at first was slow. In 1817, there was not such a thing as a regular line of steam-boats on the western waters. Two hundred steamboats now ply those waters, and half as many navigate the waters of the Atlantic coast.

The embargo and war created the manufactures of the United States. Before that period, nothing was done, on a large scale, in the way of manufactures. With some fluctuations in prosperity, they have succeeded in establishing themselves on a firm basis. A labouring man can now buy two good shirts, well made, for a dollar. Fifteen years ago, they would have cost him three times that sum.

Still more recently, a system of internal improvements has been commenced, which will have the effect, when a little further developed, of crowding within a few years the progress of generations. Already, Lake Champlain, from the north, and Lake Erie, from the west, have been connected with Albany. The Delaware and Chesapeake Bays have been united. A canal is nearly finished in the upper part of New Jersey, from the Delaware to the Hudson, by which coal is already despatched to our market. Another route is laid out across the same State, to connect New York, by a rail-road, with Philadelphia. A water communication has been opened by canals half way from Philadelphia to Pittsburgh. Considerable progress is made both on the rail-road and the canal, which are to unite Baltimore and Washington with the Ohio river. A canal of sixty miles in length is open from Cincinnati to Dayton, in the State of Ohio; and another, of more than three hundred miles in extent, to connect Lake Erie with the Ohio, is two-thirds completed.*

* Most of the works here mentioned as being in progress, are now (1836) completed, and innumerable others have since been undertaken or projected.

I mention these facts, (which, though among the most considerable, are by no means all of the same character which might be quoted,) not merely as being in themselves curious and important; though this they are in a high degree. My object is, to turn your attention to their natural effect, in keeping up a constant and high demand for labour, art, skill, and talent of all kinds, and their accumulated fruits, that is, capital; and thereby particularly inviting the young to exert themselves strenuously to take an active, industrious, and honourable part in a community, which has such a variety of employments and rewards for all its members. The rising generation beholds before it *not* a *crowded* community, but one where labour, both of body and mind, is in greater request, and bears a higher relative price, than in any other country. When it is said that labour is dear in this country, this is not a mere commercial proposition, like those which fill the pages of the price current; but it is a great *moral fact*, speaking volumes as to the state of society, and reminding the American citizen, particularly the young man who is beginning life, that he lives in a country where every man carries about with him the thing in greatest request; where the labour and skill of the human hands, and every kind of talent and acquisition, possess a relative importance elsewhere unknown,—in other words, where an *industrious man* is of the greatest consequence.

These considerations are well calculated to awaken enterprise, to encourage effort, to support perseverance; and we behold on every side that such is their effect. I have already alluded to the astonishing growth of our navigation, after the adoption of the federal constitution. It affords an example, which will bear dwelling upon, of American enterprise, placed in honourable contrast with that of Europe. In Great Britain, and in other countries of Europe, the India and China trade was, and to a great degree still is, locked up by the monopoly enjoyed by affluent companies, protected and patronised by the state, and clothed themselves, in some cases, with imperial power. The territories of the Bri-

tish East India Company are computed to embrace a population of one hundred and fifteen millions of souls. The consequence of this state of things was not the activity, but the embarrassment of the commercial intercourse with the East. Individual enterprise was not awakened. The companies sent out annually their unwieldy vessels of twelve hundred tons burden, commanded by salaried captains, to carry on the commerce which was secured to them by a government monopoly, and which, it was firmly believed, could not be carried on in any other way. Scarcely was American independence declared, when our moderate-sized merchant vessels, built with economy, and navigated with frugality, doubled both the great capes of the world. The north-western coast of America began to be crowded. Not content with visiting old markets, our intelligent ship-masters explored the numerous islands of the Indian Archipelago. Vessels from Salem and Boston, of two and three hundred tons, went to ports in those seas, that had not been visited by a foreign ship since the days of Alexander the Great. The intercourse between Boston and the Sandwich Islands was uninterrupted. A man would no more have thought of boasting that he had been round the world, than that he had been to Liverpool. After Lord Anson and Captain Cook had, by order and at the expense of the British government, made their laborious voyages of discovery and exploration in the Pacific ocean, and on the coast of America, it still remained for a merchant vessel from Boston, to discover and enter the only considerable river that flows into the Pacific, from Behring's Strait to Cape Horn. Our fellow citizen, Captain Gray, piloted the British admiral Vancouver into the Columbia river: and, in requital of this service, the British government now claims jurisdiction over it, partly on the ground of prior discovery!

This is a single instance of the propitious effect on individual enterprise of the condition of things under which we live. But the work is not all done; it is, in fact, hardly begun. This vast continent is as yet nowhere fully stocked,—almost everywhere thinly

peopled. There are yet mighty regions of it, in which the settler's axe has never been heard. These remain, and portions of them will long remain, open for coming generations, a sure preservative against the evils of a redundant population on the sea-board. The older parts of the country, which have been settled by the husbandman, and reclaimed from the state of nature, are now to be settled again by the manufacturer, the engineer, and the mechanic. First settled by a civilized, they are now to be settled by a dense population. Settled by the hard labour of the human hands, they are now to be settled by the labour-saving arts, by machinery, by the steam-engine, and by internal improvements. Hitherto, the work to be done, was that which nothing but the tough sinews of the arm of man could accomplish. This work, in most of the old States, and some of the new ones, has been done, and is finished. It was performed under incredible hardships, fearful dangers, with heart-sickening sacrifices, amidst the perils of savage tribes, and of the diseases incident to a soil on which deep forests, for a thousand years, had been laying their deposit, and which was now for the first time opened to the sun. The kind, the degree, the intensity of the labour, which has been performed by the men who settled this country, have, I am sure, no parallel in history. I believe, if a thrifty European farmer from Norfolk, in England, or Flanders, a vine-dresser from Burgundy, an olive-gardener from Italy,—under the influence of no stronger feelings than those which actuate the mass of the stationary population of those countries,—were set down in a North American forest, with an axe on his shoulder, and told to get his living, that his heart would fail him at the sight. What has been the slow work of two thousand years in Europe, has here been effected in two hundred, unquestionably under the cheering moral effect of our free institutions. We have now, in some parts of the United States, reached a point in our progress, where, to a considerable degree, a new form of society will appear; in which the wants of a settled country and a compara-

tively dense population will succeed to those of a thin population, scattered over a soil as yet but partially reclaimed. We shall henceforth feel, more and more, the want of improved means of communication. We must, in every direction, have turnpike roads, unobstructed rivers, canals, rail-roads, and steam-boats. The mineral treasures of the earth, metals, coals, ochres, fine clay, limestone, gypsum, salt, are to be brought to light, and applied to the purposes of the arts, and the service of man. Another immense capital, which nature has invested for us in the form of water power, (a natural capital, which I take to be fully equal to the steam capital of Great Britain,) is to be turned to account, by being made to give motion to machinery. Still another vast capital, lying unproductive, in the form of land, is to be realised, and no small part of it, for the first time, by improved cultivation. All the manufactures are to be introduced on a large scale; the coarser,—where it has not been done,—without delay; and the finer, in rapid succession, and in proportion to the acquisition of skill, the accumulation of capital, and the improvement of machinery. With these will grow up, or increase, the demand for various institutions for education; the call for every species of intellectual service; the need for every kind of professional assistance,—a demand rendered still more urgent, by a political organization, of itself in the highest degree favourable to the creation and diffusion of energy throughout the commonwealth.

These are so many considerations, which call on the rising generation of those destined for the active and mechanical arts, *to improve their minds.* It is only in this manner, that they can effectually ascertain the true bent of their own faculties, and, having ascertained it, employ themselves with greatest success in the way for which Providence has fitted them. It is only in this manner that they can make themselves highly respected in society, and secure to themselves the largest share of those blessings, which are the common objects of desire. In most of the countries of the older world, the greatest part of the prizes of life are literally dis-

tributed by the lottery of birth. Men are born to wealth, which they cannot alienate; to power, from which they cannot, without a convulsion of the body politic, be removed; or to poverty and depression, from which, generally speaking, they cannot emerge. Here, it rarely happens, that, even for a single generation, an independence can be enjoyed without labour and diligence bestowed on its acquisition and preservation; while, as a general rule, the place to which each individual shall rise in society is precisely graduated on the scale of capacity and exertion,—in a word, of merit. Every thing, therefore, that shows the magnitude and growth of the country,—its abundance and variety of resources,—its increasing demand for all the arts, both of ornament and utility,—is another reason, calling upon the emulous young men of the working classes to enter into the career of improvement, where there is the fullest scope for generous competition, and every talent of every kind is sure to be required, honoured and rewarded.

There is another reflection, which ought not to be omitted. The rapid growth and swift prosperity of the country have their peculiar attendant evils, in addition to those inseparable from humanity. To resist the progress of these evils, to provide, seasonably and efficaciously, the moral and reasonable remedy of those disorders of the social system, to which it may be more particularly exposed, is a duty to be performed by the enlightened and virtuous portion of the mass of the community, quite equal in importance to any other duty, which they are called to discharge. In Europe, it is too much the case, that the virtuous influences, which operate on the working classes, come down from the privileged orders, while the operatives themselves, as they are called, are abandoned to most of the vices of the most prolific source of vice,—ignorance. It is of the utmost importance, in this country, that the active walks of life should be filled by an enlightened class of men, with a view to the security and order of the community, and to protect it from those evils, which have

been thought, in Europe, to be inseparable from the great increase of the labouring population. What is done in other countries by *gens d'armes* and horse-guards, must here be done by public sentiment, or not at all. It is an enlightened moral public sentiment, that must spread its wings over our dwellings, and plant a watchman at our doors. It is perfectly well known to all who hear me, that as a class, the mechanic and manufacturing population of Europe is regarded as grossly depraved; while the agricultural population,—with as little exception,—is set down as incurably stupid. This conviction was so prevalent, that many of the most patriotic of *our* citizens were opposed to the introduction of manufactures among us, partly on the ground, that factories are, in their nature, seminaries of vice and immorality. Thus far, this fear has been most happily relieved by experience; and it is found that those establishments are as little open to reproach, on the score of morals, as any other in the community. Our mechanic and agricultural population will, in this part of the country, support the comparison, for general intelligence and morality with any in the world. This state of things, if it can be rendered permanent, is a great social triumph, and will be to America a juster subject of self gratulation than any thing belonging merely to the political, economical, and physical growth of the community. It deserves the consideration of every patriot, that the surest way of perpetuating and diffusing this most enviable state of things,—this most desirable of all the advantages, which we can have over the old world,—is to multiply the means of improving the mind, and put them within the reach of all classes. An intelligent class can scarce ever be, as a class, vicious; never, as a class, indolent. The excited mental activity operates as a counterpoise to the stimulus of sense and appetite. The new world of ideas; the new views of the relations of things; the astonishing secrets of the physical properties and mechanical powers, disclosed to the well-informed mind, present attractions, which,—unless the character is deeply sunk,—are sufficient to

counterbalance the taste for frivolous or corrupt pleasures; and thus, in the end, a standard of character is created in the community, which, though it does not invariably save each individual, protects the virtue of the mass.

3. I am thus brought to the last consideration, which I shall mention, as an encouragement to the mechanic classes to improve their minds; and that is, the comparatively higher rank which our institutions assign to them in the political system. One of the great causes, no doubt, of the enterprise and vigour which have already distinguished our countrymen, in almost every pursuit, is the absence of those political distinctions, which are independent of personal merit and popular choice. It is the strongest motive that we can suggest, for unremitted diligence in the acquisition of useful knowledge, on the part of the laborious classes, that they have a far more responsible duty to discharge to society than ever devolved on the same class in any other community. Every book of travels, not less than every opportunity of personal observation, instructs us of the deplorable ignorance of a great part of those by whom the work of the community is done, in foreign countries. In some parts of England, this class is more enlightened than it is on the continent of Europe; and in that country, great efforts are making, at the present time,—and particularly through the instrumentality of institutions like that under the auspices of which we are now assembled,—to extend the means of education to those who have hitherto been deprived of them. But it is a party question among them, not how far it is right and proper, but how far it is prudent and safe, to enlighten the people; and while the liberal party in England are urgent for the diffusion of useful knowledge, to prevent the people from breaking out into violence and revolution, the government party exclaim against a farther diffusion of knowledge, as tending to make the people discontented with their condition. I remember to have seen, not long since, a charge to the grand jury by a very eminent English judge, in which

the practice of boxing is commended, and the fear is expressed, that popular education has been pushed too far!

The man who should, in this country, express the opinion, that the education of the people foreboded ill to the state, would merely be regarded as wanting common judgment and sagacity. We are not only accustomed to that state of things, but we regard it as our great blessing and privilege, to which the higher orders in Europe look forward, as the fearful result of bloody revolutions. The representative system, and our statute of distributions, are regarded by us, not as horrors consequent upon a convulsion of society, but as the natural condition of the body politic.

This condition of the country, however, is not to be regarded merely as a topic of lofty political declamation. Its best effects are, and must be, those which are not immediately of a political character. If the mass of the people behold no privileged class placed invidiously above them; if they choose those who make and administer the laws; if the extent of public expenditure is determined by those who bear its burden,—this surely is well; but if the mass of the people here were what it is in most parts of Europe, it maybe doubted whether such a system would not be too good for them. Who would like to trust his life and fortune to a Spanish jury, or a Neapolitan jury? Under the reign of Napoleon, an attempt was made to introduce the trial by jury, not only into France, but into some of the dependent kingdoms. It has been stated, that when the peasants of some of these countries were impanneled in the jury-box, they not only considered it an excessively onorous and irksome duty, but shewed themselves utterly incapable of discharging it with sufficient discretion and intelligence.

The great use, then, to be made of popular rights should be popular improvement. Let the young man, who is to gain his living by his labour and skill, remember that he is a citizen of a free state; that on him and his contemporaries it depends, whether he will be happy and prosperous himself in his social condition,

and whether a precious inheritance of social blessings shall descend, unimpaired, to those who come after him; that there is no important difference in the situation of individuals, but that which they themselves cause, or permit to exist; that if something of the inequality in the goods of fortune, which is inseparable from human things, exist in this country, it ought to be viewed only as another excitement to that industry, by which, nine times out of ten, wealth is acquired; and still more to that cultivation of the mind, which, next to the moral character, makes the great difference between man and man. The means are already ample and accessible; and it is for the majority of the community, by a tax, of which the smallest proportion falls on themselves, to increase these means to any desirable extent.

These remarks apply, with equal force, to almost every individual. There are some considerations, which address themselves more exclusively to the ardent mind emulous of the praise of excelling. Such cannot realize too soon, that we live in an age of improvement; an age, in which investigation is active and successful in every quarter; and in which what has been effected, however wonderful, is but the brilliant promise of what may further be done. The important discoveries which have been made in almost every department of human occupation, speculative and practical, within less than a century, are almost infinite. To speak only of those which minister most directly to the convenience of man, —what changes have not been already wrought in the condition of society; what addition has not been made to the wealth of nations, and the means of private comfort, by the inventions, discoveries and improvements of the last hundred years? High in importance among these are the increased facilities for transportation. By the use of the locomotive steam-engine upon a rail-road, passengers and merchandise may now be conveyed from place to place, at the rate of fifteen and even twenty miles an hour. Although not to be compared with this, the plan of M'Adam is eminently useful, consisting, as it does, of a method, by which a surface as hard as a

rock can be carried along, over any foundation, at an expense not much greater, and, under some circumstances, not at all greater, than that of turnpike roads on the old construction. By the chemical process of bleaching, what was formerly done by exposure to the sun and air for weeks, is now done under cover, in a few days. By the machinery for separating the seed from the staple of cotton, the value of every acre of land, devoted to the culture of this most important product, has, to say the least, been doubled. By the machinery for carding, spinning, and weaving cotton, the price of a yard of durable cotton cloth has been reduced from half a dollar to a few cents. Lithography and stereotype printing are probably destined to have a very important influence in enlarging the sphere of the operations of the press. By the invention of gas lights, an inflammable air, yielding the strongest and purest flame, is extracted in a laboratory, and conducted, under ground, all over a city, and brought up, wherever it is required, in the street, in the shop, in the dwelling-house. The safety-lamp enables the miner to walk unharmed through an atmosphere of explosive gas. And, last and chiefest, the application of steam, as a general moving power, is rapidly extending its effect from one branch of industry to another, from one interest to another, of the community, and bids fair, within no distant period, to produce the most essential changes in the social condition of the world. All these beautiful, surprising, and most useful discoveries and improvements have been made within less than a century; most of them within less than half that time.

What must be the effect of this wonderful multiplication of ingenious and useful discoveries and improvements? Undoubtedly *this*, that, in addition to all their immediate beneficial consequences, they will lead to further discoveries and still greater improvements. Of that vast system, which we call Nature, and of which none but its Author can comprehend the whole, the laws and the properties, that have as yet been explored, unquestionably form but a few parts connected with a

grand succession of parts yet undiscovered, by an indissoluble, although an unseen chain. Each new truth that is found out, besides its own significance and value, is a step to the knowledge of further truth, leading off the inquisitive mind on a new track, and upon some higher path; in the pursuit of which new discoveries are made, and the old are brought into new and unexpected connections.

The history of human science is a collection of facts, which, while it proves the connection with each other of truths and arts, at first view remote and disconnected, encourages us to scrutinize every department of knowledge, however trite and familiar it may seem, with a view to discovering its relation with the laws and properties of nature, comprehended within it, but not yet disclosed. The individual, who first noticed the attractive power of magnetic substances, was gratified, no doubt, with observing a singular and inexplicable property of matter, which he may have applied to some experiments rather curious than useful. The man, who afterwards observed the tendency of a magnetized body toward the poles of the earth, unfolded a far more curious and important law of nature, but one which, resting there, was productive of no practical consequences. Then came the sagacious, or most fortunate person, who, attaching the artificial magnet to a traversing card, contrived the means of steering a vessel in the darkest night across the high seas. To him we cannot suppose that the important consequences of his discovery were *wholly* unperceived; but since, in point of history, near two centuries passed away before they began to be developed, we can hardly suppose that the inventor of the mariner's compass caught more than a glimpse of the nature of his invention. The Chinese are supposed to have been acquainted with it, as also with the art of printing, from time immemorial, without having derived from either any of those results, which have changed the aspect of modern Europe. Then came Columbus. Guided by the faithful pilot, who watches when the eye of man droops,—the patient little steers-

man, whom darkness does not blind, nor the storm drive from his post,—Columbus discovered a new world; a glorious discovery, as he, no doubt, felt it to be, both in anticipation and achievement. But it does not appear, that even Columbus had indulged a vision more brilliant than that of a princely inheritance for his own family, and a rich colony for Spain;—a vision fulfilled in his own poverty and chains, and in the corruption and degeneracy of the Spanish monarchy. And yet, from his discovery of America, so disastrous to himself and country, have sprung, directly or indirectly, most of the great changes of the political, commercial, and social condition of man in modern times. It is curious, also, to reflect, that as the Chinese, from time immemorial, (as has just been remarked,) have possessed the mariner's compass, and the art of printing, to little purpose; so they, or some people in their neighbourhood, on the north-eastern coast of Asia, either with the aid of the compass, or merely by coasting from island to island, appear to have made the discovery of America, on the western side of the continent, a thousand years before it was discovered by Columbus, on the eastern side,—without, however, deriving from this discovery any beneficial consequences to the old world or the new. It was left for the spirit of civilization, awakened in western Europe toward the close of the fifteenth century, to develope, and put in action, the great elements of power and light, latent in this discovery.

Its first effect was the establishment of the colonial system, which, with the revolution in the financial state of Europe, occasioned by the opening of the American mines, gave, eventually, a new aspect to both hemispheres. What the sum total of all these consequences has been, may be partly judged from the fact, that the colonization of the United States is but one of them. The further extension of adventures of discovery, was facilitated by new scientific inventions and improvements. The telescope was contrived, and, from the more accurately observed movements of the heavenly bodies, tables of longitude were constructed, which gave

new confidence to the navigator. He now visits new shores, lying under different climates, whose productions, transplanted to other regions, or introduced into the commerce of the world, give new springs to industry, open new sources of wealth, and lead to the cultivation of new arts. It is unnecessary to dwell on particulars; but who can estimate the full effect on social affairs of such products as sugar, coffee, tea, rice, tobacco, the potato, cotton, indigo, the spices, the dyewoods, the mineral and fossil substances, newly made to enter into general use and consumption; the discovery, transportation, and preparation of which are so many unforeseen effects of former discoveries? Each of these, directly or indirectly, furnished new materials for mind to act upon; new excitement to its energies. Navigation, already extended, receives new facilities from the use of the chronometer. The growing wealth of the community increases the demand for all the fabrics of industry; the wonderful machinery for carding, spinning, and weaving, is contrived; water and vapour are made to do the work of human hands, and almost of human intellect; as the cost of the fabric decreases, the demand for it multiplies, geometrically, and furnishes an ever-growing reward for the exertions of the ever-active spirit of improvement. Thus a mechanical invention may lead to a geographical discovery; a physical cause to a political or an intellectual effect. A discovery results in an art; an art produces a comfort; a comfort, made cheaply accessible, adds family on family to the populatiou; and a family is a new creation of thinking, reasoning, inventing, and discovering beings. Thus, instead of arriving at the end, we are at the beginning of the series, and ready to start, with recruited numbers, on the great and beneficent career of useful knowledge.

What, then, are these great and beneficial discoveries in their origin? What is the process which has led to them? They are the work of rational man, operating upon the materials existing in nature, and observing the laws and properties of the physical world. The

Creator of the universe has furnished us the material; it is all around us, above us, and beneath us; in the ground under our feet; the air we breathe; the waters of the ocean, and of the fountains of the earth; in the various subjects of the kingdoms of nature. We cannot open our eyes, nor stretch out our hands, nor take a step, but we see, and handle, and tread upon the things, from which the most wonderful and useful discoveries and inventions have been deduced. What is gunpowder, which has changed the character of modern warfare? It is the mechanical mixture of some of the most common and least costly substances. What is the art of printing? A contrivance less curious, as a piece of mechanism, than a musical box. What is the steam-engine? An apparatus for applying the vapour of boiling water. What is vaccination? A trifling ail, communicated by a scratch of the lancet, and capable of protecting human life against one of the most dreadful maladies to which it is exposed.

And are the properties of matter all discovered? its laws all found out? the uses to which they may be applied all detected? I cannot believe it. We cannot doubt, that truths now unknown are in reserve, to reward the patience and the labours of future lovers of truth, which will go as far beyond the brilliant discoveries of the last generation, as these do beyond all that was known to the ancient world. The pages are infinite in that great volume, which was written by the hand divine, and they are to be gradually turned, perused, and announced, to benefited and grateful generations, by genius and patience; and especially by patience; by untiring, enthusiastic, self-devoting patience. The progress which has been made in art and science is indeed vast. We are ready to think a pause must follow; that the goal must be at hand. But there is no goal; and there can be no pause; for art and science are in themselves progressive and infinite. They are moving powers, animated principles: they are instinct with life; they are themselves the intellectual life of man. Nothing can arrest them, which does not plunge the entire

order of society into barbarism. There is no end to truth, no bound to its discovery and application; and a man might as well think to build a tower, from the top of which he could grasp Sirius in his hand, as prescribe a limit to discovery and invention. Never do we more evince our arrogant ignorance, than when we boast our knowledge. True Science is modest; for her keen, sagacious eye discerns that there are deep, undeveloped mysteries where the vain sciolist sees all plain. We call this an age of improvement, as it is. But the Italians, in the age of Leo X. and with great reason, said the same of their age; the Romans, in the time of Cicero, the same of theirs; the Greeks, in the time of Pericles, the same of theirs; and the Assyrians and Egyptians, in the flourishing periods of their ancient monarchies, the same of theirs. In passing from one of these periods to another, prodigious strides are often made; and the vanity of the present age is apt to flatter itself, that it has climbed to the very summit of invention and skill. A wiser posterity at length finds out, that the discovery of one truth, the investigation of one law of nature, the contrivance of one machine, the perfection of one art, instead of narrowing, has widened the field of knowledge still to be acquired, and given, to those who came after, an ampler space, more numerous data, better instruments, a higher point of observation, and the encouragement of living and acting in the presence of a more intelligent age. It is not a century since the number of fixed stars was estimated at about three thousand. Newton had counted no more. When Dr. Herschel had completed his great telescope, and turned it to the heavens, he calculated that two hundred and fifty thousand stars passed through its field in a quarter of an hour!

It may not irreverently be conjectured to be the harmonious plan of the universe, that its two grand elements of mind and matter should be accurately adjusted to each other; that there should be full occupation in the physical world, in its laws and properties, and in the moral and social relations connected with it, for the

contemplative and active powers of every created intellect. The imperfection of human institutions has, as far as man is concerned, disturbed the pure harmony of this great system. On the one hand, much truth, discoverable even at the present stage of human improvement, as we have every reason to think, remains undiscovered. On the other hand, thousands and millions of rational minds, for want of education, opportunity, and encouragement, have remained dormant and inactive, though surrounded on every side by those qualities of things, whose action and combination, no doubt, still conceal the sublimest and most beneficial mysteries.

But a portion of the intellect, which has been placed on this goodly theatre, is wisely, intently, and successfully active; ripening, even on earth, into no mean similitude of higher natures. From time to time, a chosen hand, sometimes directed by chance, but more commonly guided by reflection, experiment, and research, touches, as it were, a spring until then unperceived; and, through what seemed a blank and impenetrable wall,—the barrier to all farther progress,—a door is thrown open into some before unexplored hall in the sacred temple of truth. The multitude rushes in, and wonders that the portals could have remained concealed so long. When a brilliant discovery or invention is proclaimed, men are astonished to think how long they have lived on its confines, without penetrating its nature.

It is now a hundred years since it was found out that the vapour of boiling water is, as we now think it, the most powerful mechanical agent within the control of man. And yet, even after the contrivance of the steam-engine on a most improved construction, and although the thoughts of numerous ingenious mechanicians were turned to the subject, and various experiments made, it was left for our fellow-citizen, Fulton, in a successful application of this agent, as brilliant as its first discovery, to produce another engine,—the steam-boat,—of incalculable utility and power. The entire consequences of this discovery cannot yet be predicted; but there

is one prediction relative to it, and that among the first ever made, which has been most calamitously fulfilled. When the interests of Mr. Fulton, under the laws of New York, were maintained by Mr. Emmet at the bar of the legislature of that State, at the close of his argument, he turned to his client, in an affecting apostrophe. After commending the disinterestedness with which he devoted his time, talents and knowledge to enterprises and works of public utility, to the injury of his private fortunes, he added: "Let me remind you, however, that you have other and closer ties. I know the pain I am about to give, and I see the tears I make you shed. But by that love I speak,—by that love, which, like the light of heaven, is refracted in rays of different strength, upon your wife and children, which, when collected and combined, forms the sunshine of your soul; —by that love I do adjure you, provide in time for those dearest objects of your care. Think not I would instil into your mind a mean or sordid feeling; but now, that wealth is passing through your hands, let me entreat you to hoard it while you have it." And then, after sketching the dangers which threatened his interests as guaranteed by the laws of the State, Mr. Emmet prophetically added: "Yes, my friend, my heart bleeds while I utter it, but I have fearful forebodings, that you may hereafter find in public faith a broken staff for your support, and receive from public gratitude a broken heart for your reward." From the time this prediction was uttered, the stupendous consequences of the invention of Fulton have been, every day, more and more amply developed. It has brought into convenient neighbourhood with each other some of the remotest settlements on the waters of the United States. It has made the Mississippi navigable up stream as well as down, (which it hardly was before,) incredibly accelerating, in time of peace, the settlement of its mighty valley, and making it henceforth invulnerable in time of war. It has added beyond all estimate to the value of the time, and to the amount of the capital, of a large portion of the population of the country; and, without

impairing the importance of these benefits to America, has as signally imparted them, or similar benefits, to Europe, and the rest of the civilized world. While these grand developements of the character of Fulton's invention have been taking place, the life, the estate, the family of the great inventor, have, one after another, been sacrificed and crushed. Within a few months after the eloquent appeal just recited was made, Fulton actually died of disease contracted by exposure in the gratuitous service of the public. In a few years, a decision of the Supreme Court of the United States scattered the remains of his property to the winds; and twice or thrice, since that period, has an appeal been made to Congress, on behalf of his orphan children, for such a provision as would spare them from the alternative of charity or starvation—and has been made in vain.*

But it is time to return to the facts with which I was illustrating the wonderful advances made, from time to time, in the cultivation or application of the most familiar arts. As far back as human history runs, the use of the distaff and loom is known; but it is not yet one hundred years since Sir Richard Arkwright was born; the poor journeyman barber, the youngest of thirteen children, who began and perfected the most important improvements in the machinery for manufacturing cotton, which (as has been stated on the most respectable English authority) "bore the English nation triumphantly through the wars of the French revolution," and are unquestionably of greater value to her than all her colonies, from Hindostan to Labrador.

The ocean which lies between America and Europe may be crossed in a fortnight; but, after the fleets of Tyre, of Carthage, of Rome, and of the maritime powers of the middle ages, had been, for thousands of years, accustomed to navigate the sea, it was reserved for a poor Genoese pilot, begging his way from court to court,

* An application in favour of the family of Fulton was before Congress, at the time this discourse was pronounced, before the Columbian Institute, in the hall of the House of Representatives.

and by the simple process of sailing on one course as long as he had water to float his ship, to discover a new world.

Our geographical knowledge shews us that we do not, like so many generations of our predecessors, live within the reach of other undiscovered continents; but we do unquestionably live, act, and speculate, within the reach of properties and powers of things, whose discovery and application (when they take place) will effect changes in society, as great as those produced by the magnet, the discovery of America, the art of printing, or the steam-boat. We do doubtless live within the reach of undiscovered worlds of science, art, and improvement. No royal permission is requisite to launch forth on the broad sea of discovery that surrounds us,—most full of novelty where most explored,—and it may yet be reserved for the modest and secluded lover of truth and votary of science, in the solitude of his humble researches, to lay open such laws of matter, as will affect the condition of the civilized world.

This, then, is the encouragement we have to engage in any well conceived enterprise for the diffusion of useful knowledge and the extension of general improvement. Wherever there is a human mind possessed of the common faculties, and placed in a body organized with the common senses, there is an active, intelligent being, competent, with proper cultivation, to the discovery of the highest truths, in the natural, the social, and the political world. It is susceptible of demonstration,—if demonstration were necessary,—that the number of useful and distinguished men, which are to benefit and adorn society around us, will be exactly proportioned, upon the whole, to the means and encouragements to improvement existing in the community; and every thing, which multiplies these means and encouragements, tends, in the same proportion, to the multiplication of inventions and discoverics useful and honourable to man. The mind, although it does not stand in need of high culture, to the attainment of great excellence, does yet stand in need of some culture, and cannot

thrive and act without it. When it is once awakened, and inspired with a consciousness of its own powers, and nourished into vigour by the intercourse of kindred minds, either through books or living converse, it does not disdain, but it needs not, further extraneous aid. It ceases to be a pupil; it sets up for itself; it becomes a master of truth, and goes fearlessly onward, sounding its way, through the darkest regions of investigation. But it is almost indispensable, that, in some way or other, the elements of truth should be imparted from kindred minds; and if these are wholly withheld, the intellect, which, if properly cultivated, might have soared with Newton to the boundaries of the comet's orbit, is chained down to the wants and imperfections of mere physical life, unconscious of its own capacities, and unable to fulfil its higher destiny.

Contemplate, at this season of the year, one of the magnificent oak trees of the forest, covered with thousands and thousands of acorns. There is not one of those acorns that does not carry within itself the germ of a perfect oak, as lofty and as wide-spreading as the parent stock; which does not unfold the rudiments of a tree that would strike its roots in the soil, and lift its branches toward the heavens, and brave the storms of a hundred winters. It needs for this but a handful of soil, to receive the acorn as it falls, a little moisture to nourish it, and protection from violence till the root is struck. It needs but these; and these it does need, and these it must have; and for want of them, trifling as they seem, there is not one out of a thousand of those innumerable acorns, which is destined to become a tree.

Look abroad through the cities, the towns, the villages of our beloved country, and think of what materials their population, in many parts already dense, and everywhere rapidly growing, is, for the most part, made up. It is not lifeless enginery, it is not animated machines, it is not brute beasts, trained to subdue the earth: it is rational, intellectual beings. There is not a mind, of the hundreds of thousands in our community, that is not capable of making large progress in useful

knowledge; and no one can presume to tell or limit the number of those who are gifted with all the talent required for the noblest discoveries. They have naturally all the senses and all the faculties—I do not say in as high a degree, but who shall say in no degree?—possessed by Newton, or Franklin, or Fulton. It is but a little which is wanted to awaken every one of these minds to the conscious possession and the active exercise of its wonderful powers. But this little, generally speaking, is indispensable. How much more wonderful an instrument is an eye than a telescope! Providence has furnished this eye; but art must contribute the telescope, or the wonders of the heavens remain unnoticed. It is for want of the little, that human means must add to the wonderful capacity for improvement born in man, that by far the greatest part of the intellect, innate in our race, perishes undeveloped and unknown. When an acorn falls upon an unfavourable spot, and decays there, we know the extent of the loss;—it is that of a tree, like the one from which it fell;—but when the intellect of a rational being, for want of culture, is lost to the great ends for which it was created, it is a loss which no one can measure, either for time or for eternity.

A

DISCOURSE

ON THE

IMPORTANCE TO PRACTICAL MEN

OF

SCIENTIFIC KNOWLEDGE,

AND ON THE

ENCOURAGEMENTS TO ITS PURSUIT.

BY

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DISCOURSE, &c.*

MAN is, by nature, an active being. He is made to labour. His whole organization,—mental and physical,—is that of a hard-working being. Of his mental powers we have no conception, but as certain capacities of intellectual action. His corporeal faculties are contrived for the same end, with astonishing variety of adaptation. Who can look only at the muscles of the hand, and doubt that man was made to work? Who can be conscious of judgment, memory, and reflection, and doubt that man was made to act? He requires rest, but it is in order to invigorate him for new efforts; to recruit his exhausted powers; and, as if to shew him, by the very nature of rest, that it is Means, not End:—that form of rest, which is most essential and most grateful, sleep, is attended with the temporary suspension of the conscious and active powers,—an image of death. Nature is so ordered, as both to require and encourage man to work.—He is created with wants, which cannot be satisfied without labour; at the same time, that ample provision is made by Providence, to satisfy them with labour. The plant springs up and

* On the Working Men's Party, delivered before the Charlestown Lyceum, 6th October, 1830.

grows on the spot, where the seed was cast by accident. It is fed by the moisture, which saturates the earth, or is held suspended in the air; and it brings with it a sufficient covering to protect its delicate internal structure. It toils not, neither doth it spin, for clothing or food. But man is so created, that, let his wants be as simple as they will, he must labour to supply them. If, as is supposed to have been the case in primitive ages, he lives upon acorns and water, he must draw the water from the spring; and, in many places, he must dig a well in the soil; and he must gather the acorns from beneath the oak, and lay up a store of them for winter. He must, in most climates, contrive himself some kind of clothing of barks or skins; must construct some rude shelter; prepare some kind of bed, and keep up a fire. In short, it is well known, that those tribes of our race, which are the least advanced in civilization, and whose wants are the fewest, have to labour the hardest for their support; but, at the same time, it is equally true, that, in the most civilized countries, by far the greatest amount and variety of work are done; so that the improvement, which takes place in the condition of man, consists, not in diminishing the amount of labour performed, but in enabling men to work more, or more efficiently, in the same time.—A horde of savages will pass a week in the most laborious kinds of hunting; following the chase day after day; their women, if in company with them, carrying their tents and their infant children on their backs; and all be worn down by fatigue and famine; and, in the end, they will, perhaps, kill a buffalo. The same number of civilized men and women would, probably, on an average, have kept more steadily at work, in their various trades and occupations, but with much less exhaustion; and the products of their industry would have been vastly greater; or, what is the same thing, much more work would have been done.

It is true, as man rises in improvement, he would be enabled, by his arts and machinery, to satisfy the primary wants of life, with less labour; and this may be

thought to show, at first glance, that man was not intended to be a working being; because, in proportion as he advances in improvement, less work would be required to get a mere livelihood. But here we see a curious provision of nature. In proportion as our bare natural wants are satisfied, artificial wants, or civilized wants, shew themselves. And, in the very highest state of improvement, it requires as constant an exertion to satisfy the new wants, which grow out of the habits and tastes of civilized life, as it requires, in savage life, to satisfy hunger and thirst, and keep from freezing. In other words, the innate desire of improving our condition keeps us all in a state of want. We cannot be so well off that we do not feel obliged to work, either to ensure the continuance of what we now have, or to increase it.—The man, whose honest industry just gives him a competence, exerts himself, that he may have something against a rainy day;—and how often do we not hear an affectionate father say, he is determined to spare no pains,—to work in season and out of season,—in order that his children may enjoy advantages denied to himself?

In this way, it is pretty plain, that Man, whether viewed in his primitive and savage state, or in a highly improved condition, is a working being. It is his destiny—the law of his nature—to labour. He is made for it,—and he cannot live without it; and the Apostle Paul summed up the matter, with equal correctness and point, when he said, that "if any would not work, neither should he eat."

It is a good test of principles like these, to bring them to the standard of general approbation or disapprobation. There are, in all countries, too many persons, who, from mistaken ideas of the nature of happiness, or other less reputable causes, pass their time in idleness, or in indolent pleasures; but I believe no state of society ever existed, in which the energy and capacity of labour were not commended and admired, or in which a taste for indolent pleasure was commended or admired by the intelligent part of the community. When

we read the lives of distinguished men, in any department, we find them almost always celebrated for the amount of labour they could perform. Demosthenes, Julius Cæsar, Henry the Fourth of France, Lord Bacon, Sir Isaac Newton, Franklin, Washington, Napoleon,—different as they were in their intellectual and moral qualities,—were all renowned as hard workers. We read how many days they could support the fatigues of a march; how early they rose, how late they watched; how many hours they spent in the field, in the cabinet, in the court, in the study; how many secretaries they kept employed; in short, how hard they worked. But who ever heard its being said of a man, in commendation, that he could sleep fifteen hours out of the twenty-four, that he could eat six meals a-day, and that he never got tired of his easy-chair?

It would be curious to estimate, by any safe standard, the amount in value of the work of all kinds done in a community. This, of course, cannot be done with any great accuracy. The pursuits of men are so various, and the different kinds of labour performed are so different in the value of their products, that it is scarcely possible to bring the aggregate to any scale of calculation. If we would form a kind of general judgment of the value of the labour of a community, we must look about us. All the improvements, which we behold, on the face of the earth; all the buildings of every kind in town and country; all the vehicles employed on the land and water; the roads, the canals, the wharfs, the bridges; all the property of all kinds, which is accumulated throughout the world; and all that is consumed, from day to day and from hour to hour, to support those who live upon it,—all this is the product of labour; and a proportionate share is the product of the labour of each generation.—It is plain that this comprehensive view is one, that would admit of being carried out into an infinity of details, which would furnish the materials rather for a folio than a lecture. But as it is the taste of the present day, to bring every thing down to the standard of figures, I will suggest a calculation, which

will enable us to judge of the value of the labour performed in the community in which we live.—Take the population of Massachusetts, for the sake of round numbers, at six hundred thousand souls. I presume it will not be thought extravagant to assume, that one in six performs every day a good day's work, or its equivalent. If we allow nothing for the labour of five out of six, (and this certainly will cover the cases of those too young and too old to do any work, or who can do only a part of a day's work,) and if we also allow nothing for those whose time is worth more than that of the day-labourer, we may safely assume, that the sixth person performs daily a vigorous efficient day's work of body or mind, by hand or with tools, or partly with each, and that this day's work is worth one dollar. This will give us one hundred thousand dollars a day, as the value of the work done in the State of Massachusetts. I have no doubt that it is a good deal more,—for this would be very little more than it costs the population to support itself, and allows scarce any thing for accumulation, a good deal of which is constantly taking place. It will, however, shew sufficiently the great amount of the labour done in this State, to take it as coming up, at least, to one hundred thousand dollars per day.

I have thus far laid down two propositions:—

First, that man is, by his nature, a working being; and, second, that the daily value of his work, estimated merely in money, is immensely great in any civilized community.

I have made these preliminary remarks, as an introduction to some observations, which I propose to submit, in the remainder of this lecture, on the subject of "a working men's party."—Towards the organization of such a party, steps have been taken in various parts of the country. It is probable, that a great diversity of views exists, among those who have occupied themselves upon the subject, in different places. This circumstance, and the novelty of the subject in some of its aspects, and its importance in all, have led me to

think, that we might pass an hour profitably, in its contemplation.

I will observe upon it, in the first place, then, that if, as I have endeavoured to shew, man is by nature a working being, it would follow, that a working men's party is founded in the very principles of our nature.—Most parties may be considered as artificial in their very essence; many are local, temporary, and personal. What will all our political parties be, a hundred years hence? What are they now, in nine-tenths of the habitable globe? Mere nonentities.—But the working men's party, however organized, is one that must subsist, in every civilized country, to the end of time. In other words, its first principles are laid in our nature.

It secondly follows, from what I have remarked above, that the working men's party concerns a vast amount of property, in which almost every man is interested; and in this respect it differs from all controversies and parties, which end merely in speculation, or which end in the personal advancement and gratification of a few individuals.

The next question that presents itself, is, What is the general object of a working men's party? I do not now mean, what are the immediate steps, which such a party proposes to take; but what is the main object and end, which it would secure. To this I suppose I may safely answer, that it is not to carry this or that political election; not to elevate this or that candidate for office, but to promote the prosperity and welfare of working men; that is, to secure to every man disposed to work, the greatest freedom in the choice of his pursuit, the greatest encouragement and aid in pursuing it, the greatest security in enjoying its fruits:—in other words, to make *work*, in the greatest possible degree, produce *happiness*.

The next inquiry seems to be, Who belong to the working men's party? The general answer here is obvious.—All who do the work, or are actually willing and desirous to do it, and prevented only by absolute inability, such as sickness or natural infirmity. Let us

try the correctness of this view, by seeing whom it would exclude and whom it would include.

This rule, in the first place, would exclude all bad men; that is, those who may work indeed, but who work for immoral and unlawful ends. This is a very important distinction, and if practically applied, and vigorously enforced, it would make the working men's party the purest society, that ever existed since the time of the primitive Christians. It is greatly to be feared, that scarce any of the parties, that divide the community, are sufficiently jealous on this point; and for the natural reason, that it does not lie in the very nature of the parties.—Thus, at the polls, the vote of one man is as good as the vote of another. The vote of the drunkard counts one; the vote of the temperate man counts *but* one. For this reason, the mere party politician, if he can secure the vote, is apt not to be very inquisitive about the temperance of the voter. He may even prefer the intemperate to the temperate; for to persuade the temperate man to vote with him, he must give him a good reason;—the other will do it for a good drink.

But the true principles of the working men's party require, not merely that a man should work, but that he should work in an honest way and for a lawful object. The man, who makes counterfeit money, probably works harder than the honest engraver, who prepares the bills, for those authorised by law to issue them. But he would be repelled with scorn, if he presented himself as a member of the working men's party. The thief, who passes his life, and gains a wretched, precarious subsistence, by midnight trespasses on his neighbour's grounds; by stealing horses from the stall, and wood from the pile; by wrenching bars and bolts at night, or picking pockets in a crowd, probably works harder, (taking uncertainty and anxiety into the calculation, and adding, as the usual consequence, four or five years in the compulsory service of the state,) than the average of men pursuing honest industry, even of the most laborious kind: but this hard work would not

entitle him to be regarded as a member of the working men's party.

If it be required, who is to be the judge, what kind of work is not only no title, but an absolute disqualification for admission to the working men's party, on the score of dishonesty, we answer, that, for all practical purposes, this must be left to the law of the land. It is true, that under cover and within the pale of the law, a man may do things morally dishonest, and such as ought to shut him out of the party. But experience has shewn, that it is dangerous to institute an inquisition into the motives of individuals; and so long as a man does nothing which the law forbids,—in a country where the people make the laws,—he ought, if not otherwise disqualified, to be admitted as a member of the party.

There ought, however, perhaps, to be two exceptions to this principle; one, in the case of those who pursue habitually a course of life, which, though contrary to law, is not usually punished by the law, such as persons habitually intemperate. It is plain, that these men ought not to be allowed to act with the party, because they would always be liable, by a very slight temptation, to be made to act in a manner hostile to its interests; and because they are habitually in a state of incapacity to do any intelligent and rational act.

The other exception ought to be of men who take advantage of the law to subserve their own selfish and malignant passions. This is done in various ways, but I will allude to but one. The law puts it in the power of the creditor, not merely to seize the property of the debtor, in payment of the debt, but to consider every case of inability as a case of fraudulent concealment, and to punish it, as such, by imprisonment. This is often done in a way to inflict the greatest possible pain, and in cases which not only no advantage but additional cost accrues to the creditor. A man who thus takes the advantage of the law, to wreak upon others his malignant passions, ought to be excluded not merely from the working men's party, but from the pale of civilized society.

The next question regards idlers. If we exclude from the working men's party all dishonest and immoral workers, what are we to say to the ease of the idlers? In general terms, the answer to this question is plain; they too must be excluded. With what pretence of reason can an idler ask to be admitted into the association of working men, unless he is willing to qualify himself by going to work? and then he ceases to be an idler. In fact, the man who idles away his time, acts against the law of his nature, as a working being. It must be observed, however, that there are few cases where a man is *merely* an idler. In almost every case, he must be something worse,—such as a spendthrift, a gamester, or an intemperate person; a bad son, a bad husband, and a bad father. If there are any persons dependent on him for support: if he idles away the time which he ought to devote to maintaining his wife, or his children, or his aged parents, he then becomes a robber; a man that steals the bread out of the mouths of his own family, and rends the clothes off their backs; and he is as much more criminal than the common highway robber, who takes the stranger's purse on the turnpike road, as the ties of duty to our parents and children are beyond those of common justice between man and man. But I suppose it would not require much argument to show, that the person, who leaves to want those whom he ought to support, even if he does not pass his idle hours in any criminal pursuit, has no right to call himself a working man.

There is a third class of men, whose case deserves consideration, and who are commonly called busy-bodies.—They are as different from real working men, as light is from darkness. They cannot be called idlers, for they are never at rest; nor yet workers, for they pursue no honest, creditable employment. So long as they are merely busy-bodies, and are prompted in their officious, fluttering, unproductive activity, by no bad motive and no malignant passion, they cannot, perhaps, be excluded from the party, though they have really no claim to be admitted into it. But here, too, the

case of a *mere* busy-body searce ever occurs. This character is almost always something more; a dangerous gossip, a tattling misehief-maker, a propagator, too frequently, an inventor of slander. He repeats at one fire-side, with additions, what he heard at another, under the implied obligation of confidenee; he is commonly in the front rank of all uneasy and inconsiderate movements, safely entrenched behind his neighbour, whom he pushes into trouble; and he is very fond of writing anonymous libels in the newspapers, on men of whom he knows nothing. Such men—and there are too many of them—ought to be excluded from the party.

Shutting out, then, all who work dishonestly, and all who do not work at all, and admitting the busy-bodies with great caution, the working men's party comprehends all those by whom the work of the community is really done;—all those who, by any kind of honest industry, employ the talent which their Creator has given them. All these form one great party, one comprehensive society, and this by the very law of our nature. Man is not only, as I observed in the beginning, a working being; but he is a being formed to work in society; and if the matter be carefully analyzed, it will be found, that civilization, that is, the bringing men out of a savage into a cultivated state, consists in multiplying the number of pursuits and occupations; so that the most perfect society is one where the largest number of persons are prosperously employed, in the greatest variety of ways. In such a society, men help each other, instead of standing in each other's way. The farther this division of labour is carried, the more persons must unite, harmoniously, to effect the common ends. The larger the number, on which each depends, the larger the number to which each is useful.

This union of different kinds of workmen in one harmonious society, seems to be laid in the very structure and organization of man. Man is a being consisting of a body and a soul. These words are *soon* uttered, and they are so *often* uttered, that the mighty truth which is embraced in them, searce ever engages our attention.

—But man is composed of body and soul. What is body? It is material substance; it is clay, dust, ashes. Look at it, as you tread it, unorganized, beneath your feet; contemplate it, when, after having been organized and animated, it is, by a process of corruption, returning to its original state. Matter, in its appearance to us, is an unorganized, inanimate, cold, dull, and barren thing. What it is in its essence, no one but the Being who created it knows. The human mind can conceive of it, but in a negative way. We say, that the body of man is formed of the clay or dust; because these substances seems to us to make the nearest approach to the total privation of all the properties of intellect. Such is the *body* of man.—What is his *soul*?—Its essence is as little known to us as that of body; but its qualities are angelic, divine. It is soul, which thinks, reasons, invents, remembers, hopes, and loves. It is the soul which lives; for when the soul departs from the body, all its vital powers cease; and it is dead;—and what is the body then?

Now the fact to which I wish to call your attention, is, that these two elements, one of which is akin to the poorest dust on which we tread, and the other of which is of the nature of angelic and even of divine intelligence, are, in every human being, without exception, brought into a most intimate and perfect union. We can conceive, that it might have been different. God could have created matter by itself and mind by itself. We believe in the existence of incorporeal beings, of a nature higher than man; and we behold beneath us, in brutes, plants, and stones, various orders of material nature, rising, one above another, in organization; but none of them (as we suppose) possessing mind.—We can imagine a world so constituted, that all the intellect would have been by itself, pure and disembodied; and all the material substance by itself, unmixed with mind; and acted upon by mind, as inferior beings are supposed to be acted upon by angels. But in constituting our race, it pleased the Creator to bring the two elements into the closest union; to take the body from

the dust; the soul from the highest heaven; and mould them into one.

The consequence is, that the humblest labourer, who works with his hands, possesses within him a soul, endowed with precisely the same faculties as those which, in Franklin, in Newton, or Shakspeare, have been the light and the wonder of the world; and, on the other hand, the most gifted and ethereal genius, whose mind has fathomed the depths of the heavens and comprehended the whole circle of truth, is enclosed in a body, subject to the same passions, infirmities, and wants, as the man whose life knows no alternation but labour and rest, appetite and indulgence.

Did it stop here, it would be merely an astonishing fact in the constitution of our natures;—but it does not stop here. In consequence of the union of the two principles in the human frame, every act that a man performs, requires the agency both of body and mind. His mind cannot see, but through the optic eye-glass; nor hear, till the drum of his ear is affected by the vibrations of the air. If he would speak, he puts in action the complex machinery of the vocal organs; if he writes, he employs the muscular system of the hands; nor can he even perform the operations of pure thought, except in a healthy state of the body. A fit of the toothache, proceeding from the irritation of a nerve about as big as a cambric-thread, is enough to drive an understanding, capable of instructing the world, to the verge of insanity. On the other hand, there is no operation of manual labour so simple, so mechanical, which does not require the exercise of perception, reflection, memory, and judgment; the same intellectual powers, by which the highest truths of science have been discovered and illustrated.

The degree to which any particular action (or series of actions united into a pursuit) shall exercise the intellectual powers, on the one hand, or the mechanical powers on the other, of course, depends on the nature of that action. The slave, whose life, from childhood to the grave, is passed in the field; the New Zealander,

who goes to war, when he is hungry, devours his prisoners, and leads a life of cannibal debauch till he has consumed them all, and then goes to war again; the Greenlander, who warms himself with the fragments of wrecks and drift-wood thrown upon the glaciers, and feeds himself with blubber—seem all to lead lives requiring but little intellectual action; and yet, as I have remarked, a careful reflection would shew that there is not one, even of them, who does not, every moment of his life, call into exercise, though in an humble degree, all the powers of the mind. In like manner, the philosopher who shuts himself up in his cell, and leads a contemplative existence, among books or instruments of science, seems to have no occasion to employ, in their ordinary exercise, many of the capacities of his nature for physical action;—although he also, as I have observed, cannot act, or even think, but with the aid of his body.

The same Creator who made man a mixed being, composed of body and soul, having designed him for such a world as that in which we live, has so constituted the world, and man who inhabits it, as to afford scope for great variety of occupations, pursuits, and conditions, arising from the tastes, characters, habits, virtues, and even vices, of men and communities. For the same reason, that,—though all men are alike composed of body and soul, yet no two men probably are exactly the same in respect to either;—so provision has been made, by the Author of our being, for an infinity of pursuits and employments, calling out, in degrees as various, the peculiar powers of both principles.

But I have already endeavoured to shew, that there is no pursuit and no action that does not require the united operation of both; and this of itself is a broad natural foundation for the union into one interest of all, in the same community, who are employed in honest work of any kind; viz. that, however various their occupations, they are all working with the same instruments,—the organs of the body and the powers of the mind.

But we may go a step farther, to remark the beauti-

ful process, by which Providence has so interlaced and wrought up together the pursuits, interests, and wants of our nature, that the philosopher, whose home seems less on earth than among the stars, requires, for the prosecution of his studies, the aid of numerous artificers in various branches of mechanical industry; and, in return, furnishes the most important facilities to the humblest branches of manual labour. Let us take, as a single instance, that of astronomical science. It may be safely said, that the wonderful discoveries of modern astronomy, and the philosophical system depending upon them, could not have existed, but for the *telescope*. The want of the telescope kept astronomical science in its infancy among the ancients. Although Pythagoras, one of the earliest Greek philosophers, by a fortunate exercise of sagacity, conceived the elements of the Copernican system, yet we find no general and practical improvement resulting from it. It was only from the period of the discoveries, made by the telescope, that the science advanced, with sure and rapid progress. Now the astronomer does not make telescopes. I presume it would be impossible for a person, who employed in the abstract study of astronomical science time enough to comprehend its profound investigations, to learn and practise the trade of making glass. It is mentioned, as a remarkable versatility of talent in a few eminent observers, that they have superintended the cutting and polishing the glasses or mirrors of their own telescopes. But I presume, if there never had been a telescope, till some scientific astronomer had learned to mix, melt, and mould glass, such a thing would never have been heard of. It is not less true, that those employed in making the glass could not, in the nature of things, be expected to acquire the scientific knowledge, requisite for carrying on those arduous calculations, applied to bring into a system the discoveries, made by the magnifying power of the telescope. I might extend the same remark to the other materials, of which a telescope consists. It cannot be used to any purpose of nice observation, without being very carefully mounted, on a frame of strong

metal; which demands the united labours of the mathematical instrument-maker and the brass-founder. Here then, in taking but one single step out of the philosopher's observatory, we find he needs an instrument, to be produced by the united labours of the mathematical instrument-maker, the brass-founder, the glass-polisher, and the maker of glass,—four trades.* He must also have an astronomical clock, and it would be easy to count up half a dozen trades, which directly or indirectly are connected in making a clock. But let us go back to the *object-glass* of the telescope. A glass factory requires a building and furnaces. The man who makes the glass, does not make the building. But the stone and brick mason, the carpenter, and the blacksmith, must furnish the greater part of the labour and skill, required to construct the building. When it is built, a large quantity of fuel, wood and wood-coal, or mineral coal of various kinds, or all together, must be provided; and then the materials of which the glass is made, and with which it is coloured, some of which are furnished by commerce from different and distant regions, and must be brought in ships across the sea. We cannot take up any one of *these* trades, without immediately finding that it connects itself with numerous others. Take, for instance, the mason who builds the furnace. He does not make his own bricks, nor burn his own lime; in common cases, the bricks come from one place, the lime from another, the sand from another. The brick-maker does not cut down his own wood. It is carted or brought in boats to his brick-yard. The man who carts it, does not make his own waggon; nor does the person, who brings it in boats, build his own boat. The man, who makes the waggon, does not make its tire. The blacksmith, who makes the tire, does not smelt the ore; and the forgeman, who smelts the ore, does not build his own furnace, (and there we get back to the point whence we started,) nor dig his own mine. The man, who digs the mine, does not make the pick-

* The allusion is here to the simplest form of a telescope. The illustration would be stronger in the case of a reflector.

axe, with which he digs it; nor the pump, with which he keeps out the water. The man, who makes the pump, did not discover the principle of atmospheric pressure, which led to pump-making; that was done by a mathematician at Florence, experimenting in his chamber, on a glass tube. And here we come back again to our glass; and to an instance of the close connection of scientific research with practical art. It is plain, that this enumeration might be pursued, till every art and every science were shown to run into every other. No one can doubt this, who will go over the subject in his own mind, beginning with any one of the processes of mining and working metals, of ship-building, and navigation, and the other branches of art and industry, pursued in civilized communities.

If then, on the one hand, the astronomer depends for his telescope on the ultimate product of so many arts; in return, his observations are the basis of an astronomical system, and of calculations of the movements of the heavenly bodies, which furnish the mariner with his best guide across the ocean. The prudent shipmaster would no more think of sailing for India, without his Bowditch's *Practical Navigator*, than he would without his compass; and this Navigator contains tables, drawn from the highest walks of astronomical science. Every first mate of a vessel, who works a lunar observation, to ascertain the ship's longitude, employs tables, in which the most wonderful discoveries and calculations of La Place, and Newton, and Bowditch are interwoven.

I mention this as but one of the cases, in which astronomical science promotes the service and convenience of common life; and perhaps, when we consider the degree to which the modern extension of navigation connects itself with industry in all its branches, this may be thought sufficient. I will only add, that the cheap convenience of an almanac, which enters into the comforts of every fireside in the country, could not be enjoyed, but for the labours and studies of the profoundest philosophers. Not that great learning or talent is

now required to execute the astronomical calculations of an almanac, although no inconsiderable share of each is needed for this purpose; but because, even to perform these calculations requires the aid of tables, which have been gradually formed on the basis of the profoundest investigations of the long line of philosophers, who have devoted themselves to this branch of science. For, as we observed on the mechanical side of the illustration, it is not one trade alone, which is required to furnish the philosopher with his instrument, but a great variety; so, on the other hand, it is not the philosopher in one department, who creates a science out of nothing. The observing astronomer furnishes materials to the calculating astronomer, and the calculator derives methods from the pure mathematician; and a long succession of each for ages, must unite their labours, in a great result. Without the geometry of the Greeks, and the algebra of the Arabs, the infinitesimal analysis of Newton and Leibnitz would never have been invented.

Examples and illustrations equally instructive might be found in every other branch of industry. The man who will go into a cotton mill, and contemplate it from the great water-wheel, that gives the first movement, (and still more from the steam-engine, should that be the moving power,) who will observe the parts of the machinery, and the various processes of the fabric, till he reaches the hydraulic press, with which it is made into a bale, and the canal or rail-road by which it is sent to market, may find every branch of trade and every department of science literally crossed, intertwined, interwoven with every other, like the woof and the warp of the article manufactured. Not a little of the spinning machinery is constructed on principles drawn from the demonstrations of transcendental mathematics; and the processes of bleaching and dying, now practised, are the results of the most profound researches of modern chemistry. And if this does not satisfy the inquirer, let him trace the cotton to the plantation, where it grew, in Georgia or Alabama; the indigo to Bengal; the oil to the olive-gardens of Italy, or the

fishing-grounds of the Pacific ocean; let him consider Whitney's cotton-gin; Whittemore's carding-machine; the power-loom; and the spinning apparatus; and all the arts, trades, and sciences, directly or indirectly connected with these; and I believe he will soon agree, that one might start from a yard of coarse printed cotton, which costs ten cents, and prove out of it, as out of a text, that every art and science under heaven had been concerned in its fabric.

I ought here to allude, also, to some of those pursuits which require the ability to exercise, at the same time, on the part of the same individual, the faculties, both of the intellectual and physical nature,—or which unite very high and low degrees of mental power. I have no doubt, that the talent for drawing and painting, possessed by some men to such an admirable degree, depends partly on a peculiar organic structure of the eye, and of the muscles of the hand, which gives them their more delicate perceptions of colour, and their greater skill in delineation. These, no doubt, are possessed by many individuals, who want the intellectual talent,—the poetic fire,—required for a great painter. On the other hand, I can conceive of a man's possessing the invention and imagination of a painter, without the eye and the hand required to embody on the canvass the ideas and images in his mind. When the two unite, they make a Raphael or a Titian; a Wilkie or an Allston. An accomplished statuary, such as Canova or Chantrey, must, on the one hand, possess a soul filled with all grand and lovely images, and have a living conception of ideal beauty; and on the other hand, he must be a good stone-cutter, and able to take a hammer and a chisel in his hand, and go to work on a block of marble, and chip it down to the lip of Apollo, or the eyelid of Venus. The architect must be practically acquainted with all the materials of building,—wood, brick, mortar, and stone; he must have the courage and skill to plant his moles against the heaving ocean, and to hang his ponderous domes and gigantic arches in the air; while he must have taste to combine the rough

and scattered blocks of the quarry into beautiful and majestic structures; and discern clearly in his mind's eye, before a sledge-hammer has been lifted, the elevation and proportions of the temple. The poet must know, with a school-master's precision, the weight of every word, and what vowel follows most smoothly on what consonant; at the same time, that his soul must be stored with images, feelings, and thoughts, beyond the power of the boldest and most glowing language to do more than faintly shadow out. The surgeon must, at once, have a mind naturally gifted and diligently trained, to penetrate the dark recesses of organic life; and a nerve and tact, which will enable him to guide his knife among veins and arteries, out of sight, in the living body of an agonizing, shricking fellow creature, or to take a lancet in his left hand, and cut into the apple of the eye. The lawyer must be able to reason from the noblest principles of human duty, and the most generous feelings of human nature; he must fully comprehend the mighty maze of the social relations; he must carry about with him a stock of learning almost boundless; he must be a sort of god to men and communities, who look up to him, in the hour of the dearest peril of their lives and fortunes; and he must, at the same time, be conversant with a tissue of the most senseless fictions and arbitrary technology, that ever disgraced a liberal science. The merchant must be able to look, at the same moment, at the markets and exchanges of distant countries and other hemispheres, and combine considerations of the political condition, the natural wants, the tastes and habits of different parts of the world; and he must be expert at figures,—understand book-keeping by double entry,—and know as well how to take care of a quarter chest of tea as a cargo of specie. The general-in-chief must be capable of calculating, for a twelvemonth in advance, the result of a contest, in which all the power, resource, and spirit of two great empires enter and struggle, on land and by sea; and he must have an eye, that can tell, at a glance, and on the responsibility of his life, how the stone walls,

and trenched meadows, the barns, and the woods, and the cross-roads of a neighbourhood, will favour or resist the motions of a hundred thousand men, scattered over a space of five miles, in the fury of the advance, the storm of battle, the agony of flight, covered with smoke, dust, and blood.

It was my intention to subject the art of printing to an analysis of the trades, arts, and sciences, connected with it; but I have not time to do it full justice, and the bare general idea need not be repeated. I will only say that, beginning with the invention which bears, in popular tradition, the name of Cadmus,—I mean the invention of alphabetical signs to express sounds,—and proceeding to the discovery of convenient materials for writing, and the idea of written discourse; thence to the preparation of manuscript books; and thence to the fabric, on a large scale, of linen and cotton paper, the invention of moveable types, and the printing press, the art of engraving on metal, of stereotype printing, and of the power-press,—we have a series of discoveries, branching out into others in every department of human pursuit; connecting the highest philosophical principles with the results of mere manual labour, and producing, in the end, that system of diffusing and multiplying the expression of thought, which is, perhaps, the glory of our human nature. Pliny said, that the Egyptian reed was the support on which the immortal fame of man rested. He referred to its use in the manufacture of paper. We may, with greater justice, say as much of the manufacture of paper from rags, and of the printing press, neither of which was known to Pliny. But with all the splendour of modern discoveries and improvements in science and art, I cannot but think that he who, in the morning of the world, first conceived the idea of representing sounds by visible signs, took the most important step in the march of improvement. This sublime conception was struck out in the infancy of mankind. The name of its author, his native country, and the time when he lived, are known only by very uncertain tradition; but though all the intelligence

of ancient and modern times, and in the most improved countries, has been concentred into a focus, burning and blazing upon this one spot, it has never been able to reduce it to any simpler elements, nor to improve, in the slightest degree, upon the original suggestion of Cadmus.

In what I have thus far submitted to you, you will probably have remarked, that I have illustrated chiefly the connection with each other of the various branches of science and art; of the intellectual and physical principles. I have not distinctly shown the connection of the moral principle, in all its great branches, with both. This subject would well form the matter of a separate essay. But its elementary ideas are few and plain. The arts and sciences whose connection we have pointed out, it is plain, require for their cultivation a civilized state of society. They cannot thrive in a community which is not in a state of regular political organization, under an orderly system of government, uniform administration of laws, and a general observance of the dictates of public and social morality. Farther, such a community cannot exist without institutions of various kinds for elementary, professional, and moral education; and connected with these, are required the services of a large class of individuals, employed in various ways, in the business of instruction; from the meritorious schoolmaster, who teaches the little child its A, B, C, to the moralist, who lays down the great principles of social duty for men and nations, and the minister of divine truth, who inculcates those sanctions, by which God himself enforces the laws of reason. There must also be a class of men, competent by their ability, education, and experience, to engage in the duty of making and administering the law; for, in a lawless society, it is impossible that any improvement should be permanent. There must be another class competent to afford relief to the sick, and thus protect our frail natures from the power of the numerous foes that assail them.

It needs no words to show, that all these pursuits are,

in reality, connected with the ordinary work of society, as directly as the mechanical trades by which it is carried on. For instance, nothing would so seriously impair the prosperity of a community, as an unsound and uncertain administration of justice. This is the last and most fatal symptom of decline in a state. A community can bear a very considerable degree of political despotism, if justice is duly administered between man and man. But where a man has no security, that the law will protect him in the enjoyment of his property; where he cannot promise himself a righteous judgment in the event of a controversy with his neighbour; where he is not sure, when he lies down at night, that his slumbers are safe, there he loses the great motives to industry and probity; credit is shaken; enterprise disheartened, and the state declines. The profession, therefore, which is devoted to the administration of justice, renders a service to every citizen of the community, as important as to those whose immediate affairs require the aid of counsel.

In a very improved and civilized community, there are also numerous individuals, who, without being employed in any of the common branches of industry, or of professional pursuit, connect themselves, nevertheless, with the prosperity and happiness of the public, and fill a useful and honourable place in its service. Take, for instance, a man like Sir Walter Scott, who, probably, never did a day's work in his life, in the ordinary acceptation of the term, and who has for some years retired from the subordinate station he filled in the profession of the law, as sheriff of the county and clerk of the Court. He has written and published at least two hundred volumes of wide circulation. What a vast amount of the industry of the community is thereby put in motion!—The booksellers, printers, paper-makers, press-makers, type-makers, bookbinders, leather-dressers, ink-makers, and various other artisans required, to print, publish, and circulate the hundreds and thousands of volumes of the different works which he has written, must be almost numberless. I have not the

least doubt, that, since the series of his publications begun, if all whose industry,—directly or remotely,—has been concerned in them, not only in Great Britain, but in America, and on the continent of Europe, could be brought together, and stationed side by side, as the inhabitants of the same place, they would form *a very considerable town*. Such a person may fairly be ranked as a working man.

And yet I take this to be the least of Sir Walter Scott's deserts. I have said nothing of the service rendered to every class, and to every individual in every class, by the writer, who beguiles of their tediousness the dull hours of life,—who animates the principle of goodness within us, by glowing pictures of struggling virtue,—who furnishes our young men and women with books, which they may read with interest, and not have their morals poisoned as they read them. Our habits, our principles, our characters,—whatever may be our pursuit in life,—depend very much on the nature of our youthful pleasures, and on the mode in which we learn to pass our leisure hours. And he who, with the blessing of Providence, has been able, by his mental efforts, to present virtue in her strong attractions, and vice in her native deformity, to the rising generation, has rendered a service to the public, greater even than his, who invented the steam-engine, or the mariner's compass.

I have thus endeavoured to show, in a plain manner, that there is a close and cordial union between the various pursuits and occupations, which receive the attention of men in a civilized community:—that they are links of the same chain, every one of which is essential to its strength.

It will follow, as a necessary consequence, as the dictate of reason, and as the law of nature,—that every man in society, whatever his pursuit, who devotes himself to it, with an honest purpose, and in the fulfilment of the social duty which Providence devolves upon him, is entitled to the good fellowship of each and every other member of the community,—that all are the parts of

one whole, and that between those parts, as there is but one interest, so there should be but one feeling.

Before I close this lecture, permit me to dwell for a short time on the principle which I have had occasion to advance above, that the immortal element of our nature—the reasoning soul—is the inheritance of all our race. As it is this which makes man superior to the beasts that perish, so it is this, which, in its moral and intellectual endowments, is the sole foundation for the only distinction between man and man, which have any real value. This consideration shows the value of institutions for education and for the diffusion of knowledge. It was no magic, no miracle, which made Newton, and Franklin, and Fulton. It was the patient, judicious, long-continued cultivation of powers of the understanding, eminent, no doubt, in degree, but not differing in kind, from those which are possessed by every individual in this assembly.

Let every one, then, reflect, especially every person not yet past the forming period of his life, that he carries about in his frame, as in a casket, the most glorious thing, which, this side heaven, God has been pleased to create—an intelligent spirit. To describe its nature, to enumerate its faculties, to set forth what it has done, to estimate what it can do, would require the labour of a life devoted to the history of man. It would be vain on this occasion, and in these limits, to attempt it. But let any man compare his own nature with that of a plant, of a brute beast, of an idiot, of a savage; and then consider that it is in mind alone, and the degree to which he improves it, that he differs essentially from any of them.

And let no one think he wants opportunity, encouragement, or means. I would not undervalue these, any or all of them; but, compared with what the man does for himself, they are of little account. Industry, temperance, and perseverance are worth more than all the patrons that ever lived in all the Augustan ages. It is these that create patronage and opportunity. The cases of our Franklin and Fulton are too familiar to bear re-

petition. Consider that of Sir Humphrey Davy, who died last year, and who was, in some departments of science, the first philosopher of the age.* He was born at Penzance in Cornwall, one of the darkest corners of England: his father was a carver of wooden images for signs, and figure-heads, and chimney-pieces. He himself was apprenticed to an apothecary, and made his first experiments in chemistry with his master's phials and gallipots, aided by an old syringe, which had been given him by the surgeon of a French vessel, wrecked on the Land's End. From the shop of the apothecary, he was transferred to the office of a surgeon; and never appears to have had any other education than that of a Cornish school, in his boyhood. Such was the beginning of the career of the man, who, at the age of twenty-two, was selected, by our own countryman, Count Rumford, (himself a self-taught benefactor of mankind,) to fill the chair of chemistry at the Royal Institution, in London: such was the origin and education of the man who discovered the metallic basis of the alkalis and the earths—invented the safety-lamp—and placed himself, in a few years, in the chair of the Royal Society of London, and at the head of the chemists of Europe. Sir Humphrey Davy's most brilliant discoveries were effected by his skilful application of the galvanic electricity—a principle, whose existence had been detected a few years before by an Italian philosopher, from noticing the contractions of a frog's limb—a fact, which shows how near us, in every direction, the most curious facts lie scattered by nature. With an apparatus, contrived by himself, to collect and condense this powerful agent, Sir Humphrey succeeded in decomposing the earths and the alkalis; and in extracting from common potash, the metal (before unknown) which forms its base;—possessing at 70° of the thermometer, the lustre and general appearance of mercury; at 50°, the appearance of polished silver, and the softness of

* The sketch of Sir Humphrey Davy, which follows, to the end of the discourse, is abridged from the article in the Annual Biography, for 1830.

wax; so light that it swims in water, and so inflammable that it takes fire when thrown on ice.

These are, perhaps, but brilliant novelties, though connected, no doubt, in the great chain of cause and effect, with principles of art and science conducive to the service of man. But the invention of the safety-lamp, which enables the miner to walk with safety through an atmosphere of explosive gas, and has already preserved the lives of hundreds of human beings, is a title to glory and the gratitude of his fellow-men, which the most renowned destroyer of his race mighty envy.

The counsels of such a man, in his retirement and meditation, are worth listening to. I am sure you will think I bring this discourse to the best conclusion, by repeating a sentence from one of his moral works:—

"I envy," says he, "no quality of the mind or intellect in others,—not genius, power, wit, or fancy; but if I could choose what would be most delightful, and I believe, most useful to me, I should prefer A FIRM RELIGIOUS BELIEF to every other blessing."

A

DISCOURSE, &c.*

NOTWITHSTANDING the numerous institutions for promoting useful knowledge, in our community, it was still found that many were excluded from the benefit of them. The number of persons that can be accommodated in any one hall, is of course limited; and it has been thought desirable to make the attempt to provido an additional course of lectures, on the various branches of useful knowledge, for the benefit of those who have not had it in their power, for this or any other reason, to obtain access to the other institutions, which have set so praiseworthy an examplc in this work of public utility. We are assembled, this evening, to make the beginning of this new course of popular instruction.

The plan of this course of lectures was suggested at so late a period this year, that it may not, perhaps, be possible, the present season, to carry it fully into effect, in such a manner as is wished and designed, in reference to the choice and variety of subjects. It is intended, eventually, that it should extend to the various branches of natural science. It will impart useful information relative to the Earth, the Air, and the Ocean,—tho wonders of the heavens,—and the mineral treasures be-

* Delivered as the Introduction to the Franklin Lectures, in Boston, November 14, 1831.

neath the surface of the globe. It may extend to the different branches of natural history, and acquaint you with the boundless variety of the animated creation. The various properties of natural bodies will form a prominent subject of consideration, as the basis of so many of the arts and trades, and the sources from which so many of the wants of man are supplied. In like manner, those natural powers and properties of matter, the agency of fire, water, steam, and weight, which, in their various combinations, produce the wonders of improved machinery, by which industry is facilitated, and the most important fabrics are furnished cheaply and abundantly, will not be overlooked. It may be supposed that a due share of attention will be paid to the geographical survey of the globe,—to the history of our own race,—the fortunes of the several nations into which mankind have been divided,—and the characters of great and good men, who, long after they have departed from life, survive in the gratitude and admiration of their fellow-men. A general and intelligible view of the constitution and laws of the country, in which we have the happiness to live, tending, as it will, to enlighten us in the discharge of our duties as citizens, will no doubt be presented to you by some who will take a part in these lectures. Nor will they, I venture to hope, be brought to a close, without having occasionally directed your thoughts to those views of our common nature, which belong to us as rational and immortal beings, and to those duties and relations which appertain to us as accountable agents.

The general plan of these lectures extends to these and all other branches of sound and useful knowledge, —to be treated in such order as circumstances may suggest,—and with such variety and selection of subjects and fulness of detail, as the convenience of the lecturers and the advantage of the audience may dictate. They have been called the *Franklin Lectures*, in honour of our distinguished townsman, the immortal Franklin, the son of a tallow-chandler, and the apprentice to a printer in this town—a man who passed all his early

years, and a very considerable portion of his life, in manual industry; and who was chiefly distinguished by his zealous and successful efforts for the promotion of useful knowledge. His name has given lustre to the highest walks of science, and adorns one of the proudest pages of the history of our country and the world. But we have thought it was still more a name of hope and promise, for an institution like this, which aims to promote useful knowledge, (the great study of his life,) among that class of our fellow-citizens, from which it was ever his pride himself to have sprung.

It would seem, at the commencement of a course of public instruction of this kind, a pertinent inquiry, *Why* should we endeavour to cultivate and inform our minds by the pursuit of knowledge?

This question, to which the good sense of every individual furnishes, without meditation, some general reply, demands a full and careful answer. I shall endeavour, in this address, to state some of the reasons which go to furnish such an answer.

All men should seek to cultivate and inform their minds by the pursuit of useful knowledge, as the great means of happiness and usefulness.

All other things being equal, the pursuit and attainment of knowledge are, at the time, the surest source of happiness. I do not mean that knowledge will make up for the want of the necessaries and comforts of life: it will not relieve pain, heal sickness, nor bring back lost friends. But if knowledge will not do this, ignorance will do it still less. And it may even be affirmed, and all who have made the experiment themselves will testify to the truth of the remark, that nothing tends more to soothe the wounded feelings, to steal away the mind from its troubles, and to fill up the weariness of a sick-chamber and a sick-bed, than, for instance, some intelligible, entertaining, good book, read or listened to.

But knowledge is still more important, as the means of being useful; and the best part of the happiness which it procures us, is of that purer and higher kind, which flows from the consciousness that, in some way

or other, by good example or positive service, we have done good to our fellow-men. One of the greatest modern philosophers said, that *knowledge is power;* but it is power, because it is usefulness. It gives men influence over their fellow-men, because it enables its possessors to instruct, to counsel, to direct, to please, and to serve their fellow-men. Nothing of this can be done without the cultivation and improvement of the mind.

It is the mind which enables us to be useful, even with our bodily powers. What is strength, without knowledge to apply it? What are the curiously organized hands, without skill to direct their motion? The idiot has all the bodily organs and senses of the most intelligent and useful citizen.

It is through mind that man has obtained the mastery of nature and all its elements, and subjected the inferior races of animals to himself. Take an uninformed savage, a brutalized Hottentot, in short, any human being in whom the divine spark of reason has never been kindled to a flame, and place him on the sea-shore in a furious storm, when the waves are rolling in, as if the fountains of the deep were broken up. Did you not know, from certain experience, that man, by the cultivation of his mind, and the application of his useful arts, had actually constructed vessels, in which he floats securely on the top of these angry waves, you would not think it possible that a being, like that we have mentioned, could for one moment resist their fury. It is actually related of some of the North American Indians, a race of men who are trained from their infancy to the total suppression of their emotions of every kind, and who endure the most excruciating torments at the stake, without signs of suffering, that when they witnessed, for the first time, on the western waters of the United States, the spectacle of a steam-boat under weigh, moving along without sails or oars, and spouting fire and smoke, even they could not refrain from exclamations of wonder. Hold out a handful of wheat or Indian corn to a person wholly uninformed of their nature, and ignorant of the mode of cultivating them, and tell him,

that by scattering these dry kernels abroad, and burying them in the cold damp earth, you can cause a harvest to spring up, sufficient for a winter's supply of food, and he will think you are mocking him by vain and extravagant tales. But it is not the less true, that in these, and in every other instance, it is the mind of man, possessed of the necessary knowledge and skill, that brings into useful operation, for the supply of human want, and the support and comfort of human life, the properties and treasures of the natural world, the aid of inferior animals, and even our own physical powers.

When, therefore, we improve our minds by the acquisition of useful knowledge, we appropriate to ourselves, and extend to others, to whom we may impart our knowledge, a share of this natural control over all other things, which Providence has granted to his rational children.

It cannot, it is true, be expected to fall to the lot of many individuals, by extending their knowledge of the properties and laws of the natural world, to strike out new discoveries and inventions of the highest importance. It is as much as most men can hope, and promise themselves, to be enabled to share the comfort and benefit of the unnumbered improvements, which, from the beginning of time, have been made by others, and which, taken together, make up the civilization of man. Still there are examples, in almost every age, of men, who, by the happy effects of their individual pursuit of useful knowledge, have conferred great benefits upon all mankind. I presume, that in consequence of the success of Arkwright, in inventing the machinery for spinning cotton,—of Cartwright, in inventing the power-loom,—and our own countryman Whitney, in inventing a machine for preparing cotton, the expense of necessary clothing is diminished two-thirds for every man in Europe and America. In other words, the useful knowledge acquired and imparted to the world by these three men, has enabled every man, woman, and child in the civilized world, as far as clothing is concerned, to live at one-third of the former cost. We are struck with asto-

nishment when we behold these curious machines;—when we look, for instance, at a watch, and see a few brass wheels, put in motion by a little bit of elastic steel, counting out the hours and minutes, by night and by day, and even enabling the navigator to tell how many miles he has sailed upon the waste ocean, where there are no marks or monuments by which he can measure his progress. But how much more wonderful is the mind of man, which, in the silence of the closet, turned in upon itself, and deeply meditating upon the properties and laws of matter, has contrived this wonderful machine!

The invention of the power-loom by Mr. Cartwright, beautifully illustrates the strength and reach of the intellectual principle, resolutely applied to a given object. In consequence of Arkwright's machinery for spinning, it was soon found that there would be a difficulty in weaving all the yarn that could be spun. It was remarked in a company, where Mr. Cartwright was present, in 1784, that, in order to remedy this evil, Mr. Arkwright must exercise his ingenuity, and invent a weaving-mill, in order to work up the yarn which should be spun in his spinning-mills. The subject was discussed; and it was pronounced by the gentlemen present, who were manufacturers from Manchester in England, to be impossible. Mr. Cartwright thought otherwise: he said there had been lately exhibited in London a machine for playing chess; and he felt quite sure, that it could not be more difficult to construct a machine to weave cloth, than a machine which could go through all the movements of such a complicated game. Mr. Cartwright was a clergyman, forty years old, and had never given his attention to the subject of machinery. This subject, however, was so strongly on his mind, that, some time afterwards, he resolved to make the attempt to invent a weaving machine. He had not at that time, it appears, ever seen even a common loom. But reasoning upon the nature of the processes necessary to be gone through to cross the threads, in such a way as to make a piece of cloth, he hit upon the plan

of a loom, and, with the assistance of a carpenter and blacksmith, he made one. It was a very rude one. "The warp," says Mr. Cartwright, "was laid perpendicularly: the reed fell with a force of at least half a hundred weight, and the springs which threw the shuttle were strong enough to throw a Congreve rocket." Besides this, it required the strength of two powerful men to work it, and that at a slow rate, and for a short time. But the principle was there. Mr. Cartwright now went and examined the looms of common form, and soon succeeded in constructing one very nearly resembling the power-looms which are now in use. In the account of this interesting invention, which I am quoting,* it is said that "Dr. Cartwright's children still remember often seeing their father, about this time, walking to and fro, in deep meditation, and occasionally throwing his arms from side to side, on which they used to be told that he was thinking of weaving and throwing the shuttle." Some time after he had brought his first loom to perfection, a manufacturer, who had called upon him to see it at work, after expressing his admiration at the ingenuity displayed in it, remarked, that wonderful as Mr. Cartwright's mechanical skill was, there was one thing that would effectually baffle him, and that was the weaving of patterns in checks, or, in other words, the combining in the same web, of a pattern or fancy figure, with the crossing colours that make the check. Mr. Cartwright made no reply to this observation at the time; but, some weeks after, on receiving a second visit from the same person, he had the pleasure of showing him a piece of muslin, of the description mentioned, beautifully woven by machinery. The man was so much astonished, that he declared that something more than human agency must have been concerned in the fabric.

The wonderful results of the sagacity and perseverance of Fulton, in carrying into effect the conceptions of his mind on the subject of steam navigation, still

* Library of Entertaining Knowledge, Vol. viii. p. 347. Second American edition.

more nobly illustrate the creative power of the human intellect; but it is a matter too familiar to need comment.

But it must not be supposed, from the instances I have chosen, to shew the amount of good which may be done by the exercise of the mental powers, that it is confined to the material comforts of life—to steam-boats, looms, or machinery for spinning. Far from it. The true and most peculiar province of its efficacy is the moral condition. Think of the inestimable good conferred on all succeeding generations, by the early settlers of America, who first established the system of public schools, where instruction should be furnished, *gratis*, to all the children in the community. No such thing was before known in the world. There were schools and colleges, supported by funds which had been bequeathed by charitable individuals; and, in consequence, most of the common schools of this kind in Europe were regarded as a kind of pauper establishments, to which it was not respectable to have recourse. So deep-rooted is this idea, that when I have been applied to for information as to our public schools, from those parts of the United States where no such system exists, I have frequently found it hard to obtain credit, when I have declared that there was nothing disreputable in the public opinion here, in sending children to schools supported at the public charge. The idea of such schools, therefore, when it first crossed the minds of our forefathers, was entirely original; but how much of the prosperity and happiness of their children, and posterity, has flowed from this living spring of public intelligence! So, too, the plan of Sunday schools, which have proved a blessing of inestimable value in Europe and America, and particularly to thousands who are deprived of the advantages of other institutions. It is probable, that instruction is now given in the Sunday schools to more than a million and a half of pupils, by more than one hundred and fifty thousand teachers. This plan was the happy suggestion of an humble individual—a printer—who contemplated, at first, nothing but the education of the destitute and friendless chil-

dren in his immediate neighbourhood. After labouring in this noble field of usefulness for twenty years, and among the class of population most exposed to the temptations to crime, he had the satisfaction of being able to say, that out of three thousand scholars, he had heard of but one who had been sent to jail as a criminal.* Who would not be ashamed to compare the pure and happy renown of the man who had extended, by the suggestion of this simple, but before untried plan of education, the blessings of instruction to a million and a half of his fellow-creatures, with the false and unmerited glory which has been awarded to conquerors, whose wars have hurried their millions of victims to cruel and untimely death!

This topic might be illustrated, perhaps, still more powerfully, by depicting the evils which flow from ignorance. These are deplorable enough in the case of the individual; although, if he live surrounded by an intelligent community, the disastrous consequences are

* See a very interesting address, at the celebration of the Sunday School jubilee, or the fiftieth year from the institution of Sunday schools, by Robert Raikes: delivered at Charleston, S. C., September 14, 1831, by the Hon. Thomas Smith Grimke. I find, however, the following statement in a public print, of the accuracy of which I have no means of judging:—

"The credit of originating these institutions has usually been given to Mr. Raikes, a newspaper proprietor of Gloucester, who died some years ago. It now appears, however, from statements and documents of unquestionable authenticity, that the plan of the first school of this description which was established at Gloucester, in 1780, originated with the Rev. Thomas Stock, head master of the cathedral school of that city. Mr. Stock, who was in narrow circumstances, communicated the details of his plan to Mr. Raikes, when the latter assisted him with his purse; and, having taken a very active and zealous part in promoting the establishment of Sunday schools, he ultimately obtained all the merit of being their founder. Mr. Raikes, who is undoubtedly entitled to much credit for his benevolent exertions in the cause of education, lived to see 250,000 children enrolled in these schools. The number now enjoying the benefit of instruction on the Sabbath, in England, is 1,250,000. At Birmingham, the system has been carried to a much greater extent than in any other town in England—nearly 13,000 Sunday school pupils having been mustered there on the occasion of the late jubilee."

limited. But the general ignorance of large numbers and entire classes of men, acting under the unchastened stimulus of the passions, and excited by the various causes of discontent which occur in the progress of human affairs, is often productive of scenes which make humanity shudder. I know not that I could produce a more pertinent illustration of this truth, than may be found in the following extract from a foreign journal. It relates to the outrages committed by the peasantry in a part of Hungary, in consequence of the ravages of the cholera in that region :—

" The suspicion that the cholera was caused by poisoning the wells, was universal among the peasantry of the counties of Zips and Zemplin; and every one was fully convinced of its truth. The first commotion arose in Klucknow, where, it is said, some peasants died in consequence of taking the preservatives,—whether by an immoderate use of medicine, or whether they thought they were to take chlorate of lime internally, is not known. This story, with a sudden and violent breaking out of cholera at Klucknow, led the peasants to a notion of the poisoning of the wells, which spread like lightning. In the sequel, upon the attack of the estate of Count Czaki, a servant of the chief bailiff was on the point of being murdered, when, to save his life, he offered to disclose something important. He said that he received from his master two pounds of poisonous powder, with orders to throw it into the wells; and, with an axe over his head, took oath publicly in the church to the truth of his statement. These circumstances, and the fact that the peasants, when they forcibly entered the houses of the land-owners, everywhere found chlorate of lime, which they took for the poisonous powder, confirmed their suspicions, and drove the people to madness. In this state of excitement they committed the most appalling excesses. Thus, for instance, when a detachment of thirty soldiers, headed by an ensign, attempted to restore order in Klucknow, the peasants, who were ten times their number, fell upon them: the soldiers were released, but the ensign was

bound, tortured with scissors and knives, then beheaded, and his head fixed on a pike as a trophy. A civil officer, in company with the military, was drowned, his carriage broken, and chlorate of lime being found in the carriage, one of the inmates was compelled to eat it till he vomited blood, which again confirmed the notion of poison. On the attack of the house of the Lord at Klucknow, the Countess saved her life by piteous entreaties; but the chief bailiff, in whose house chlorate of lime was unhappily found, was killed, together with his son, a little daughter, a clerk, a maid, and two students who boarded with him. So the bands went from village to village,—wherever a nobleman or a physician was found, death was his lot; and in a short time it was known that the high constable of the county of Zemplin, several counts, nobles, and parish priests had been murdered. A clergyman was hanged, because he refused to take an oath that he had thrown poison into the well: the eyes of a countess were put out, and innocent children cut to pieces. Count Czaki, having first ascertained that his family was safe, fled from his estate at the risk of his life, but was stopped at Kirchtrauf, pelted with stones, and wounded all over, torn from his horse, and only saved by a worthy merchant, who fell on him, crying, 'Now I have got the rascal.' He drew the count into a neighbouring convent, where his wounds were dressed, and a refuge afforded him. His secretary was struck from his horse with an axe, but saved in a similar manner, and in the evening conveyed, with his master, to Leutschau. But enough of these horrible scenes."

It is by no means my purpose, on this occasion, to attempt even a sketch of what the judicious exercise of the intelligent principle has enabled men to do, for the improvement of their fellow-men. Enough, I venture to hope, has been said to put all who favour me with their attention, upon the reflection, that it is only by its improvement that it is possible for a man to render himself useful to man; and, consequently, that it is in this way alone that he can taste the highest and purest

pleasure which our natures can enjoy—that which proceeds from the consciousness of having been useful to others.

But it is time that I should make a few remarks on another subject, which would seem appropriately to belong to this occasion.

An idea, I fear, prevails, that truths, such as I have now attempted to illustrate, are obvious enough in themselves, but that they apply only to men of literary education, to professional characters, and persons of fortune and leisure; and that it is out of the power of the other classes of society, and those who pass most of their time in manual labour and mechanical industry, to engage in the pursuit of knowledge, with any hope of being useful to themselves and others.

This I believe to be a great error. I trust we may regard the meeting of this numerous audience as a satisfactory proof that you consider it an error; and that you are persuaded that it is in your power to enjoy the pleasures and the benefits which flow from the pursuit of useful knowledge.

What is it that we wish to improve? The mind.—Is this a thing monopolized by any class of society? God forbid: it is the heritage with which he has endowed all the children of the great family of man. Is it a treasure belonging to the wealthy? It is talent bestowed alike on rich and poor—high and low. But this is not all: mind is in all men, and in every man, the same active, living, and creative principle,—it is the man himself. One of the renowned philosophers of heathen antiquity, beautifully said of the intellectual faculties, I call them not *mine*, but *me*. It is these which make the man—which are the man. I do not say that opportunities, that wealth, leisure, and great advantages for education are nothing; but I do say, they are much less than is commonly supposed: I do say, as a general rule, that the amount of useful knowledge which men acquire, and the good they do with it, are by no means in direct proportion to the degree to which they have enjoyed what are commonly called

the great advantages of life. Wisdom does sometimes, but not most commonly, feed her children with a silver spoon. I believe it is perfectly correct to say, that a small proportion only of those who have been most distinguished for the improvement of their minds, have enjoyed the best advantages for education. I do not mean to detract, in the least degree, from the advantages of the various seminaries for learning, which public and private liberality has founded in our country. They serve as places where a large number of persons are prepared for their employment in the various occupations which the public service requires. But, I repeat it, of the great benefactors of our race,—the men, who, by wonderful inventions, remarkable discoveries, and extraordinary improvements, have conferred the most eminent service on their fellow-men, and gained the highest names in history,—by far the greater part have been men of humble origin, narrow fortunes, small advantages, and self-taught.

And this springs from the nature of the mind of man, which is not, like natural things, a vessel to be filled up from without, into which you may pour a little or pour much, and then measure, as with a gauge, the degrees of knowledge imparted. The knowledge that *can* be *so* imparted, is the least valuable kind of knowledge; and the man who has nothing but this, may be very learned, but cannot be very wise. We do not invite you to these lectures, as if their object would be attained when you have heard the weekly address. It is to kindle the understanding to the consciousness of its own powers,—to make it feel within itself that it is a living, spiritual thing,—to feed it, in order that it may itself begin to act and operate, to compare, contrive, invent, improve, and perfect. This is our object—an object as much within the reach of every man who hears me, as if he had taken a degree in the best college in Christendom.

In this great respect,—the most important that touches human condition,—we are all equal. It is not more true that all men possess the same natural senses and

organs, than that their minds are endowed with the same capacities for improvement, though not, perhaps, all in the same degree. The condition in which they are placed is certainly not a matter of entire indifference. The child of a savage, born in the bosom of a barbarous tribe, is, of course, shut out from all chance of sharing the improvements of civilized communities. So, in a community like our own, an infant condemned, by adverse circumstances, to a life of common street beggary, must be considered as wholly out of the reach of all improving influences. But Shakspeare, whose productions have been the wonder and delight of all who speak the English language, for two hundred years, was a runaway youth, the son of a wool-comber, who got his living in London by holding horses at the door of the theatre, for those who went to the play; and Sir Richard Arkwright, who invented the machinery for spinning cotton, of which I have already spoken, was the youngest of thirteen children of a poor peasant, and, till he was thirty years of age, followed the business of a travelling barber.

As men bring into the world with them an equal intellectual endowment,—that is, minds equally susceptible of improvement, so in a community, like that in which we have the happiness to live, the means of improvement are much more equally enjoyed than might at first be supposed. Whoever has learned to read, possesses the keys of knowledge; and can, whenever he pleases, not only unlock the portals of her temple, but penetrate to the inmost halls and most secret cabinets. A few dollars, the surplus of the earnings of the humblest industry, are sufficient to purchase the use of books, which contain the elements of the whole circle of useful knowledge.

It may be thought that a considerable portion of the community *want time* to attend to the cultivation of their minds. But it is only necessary to make the experiment to find *two things*,—one, how much useful knowledge can be acquired in a very little time,—and the other, how much time can be spared, by good ma-

nagement, out of the busiest day. Generally speaking, our duties leave us time enough, if our passions would but spare us: our labours are much less urgent in their calls upon us, than our indolence and our pleasures. There are very few pursuits in life, whose duties are so incessant, that they do not leave a little time every day to a man, whose temperate and regular habits allow him the comfort of a clear head and a cheerful temper in the intervals of occupation; and then there is one day in seven which is redeemed to us, by our blessed religion, from the calls of life, and affords us all time enough for the improvement of our rational and immortal natures.

It is a prevalent mistake to suppose, that any class of men have much time to spend, or do spend much time in mere contemplation and study. A small number of literary men may do this; but the very great majority of professional men,—lawyers, doctors, and ministers, men in public station, rich capitalists, merchants,—men, in short, who are supposed to possess eminent advantages, and ample leisure to cultivate their minds, are all very much occupied with the duties of life, and constantly and actively employed in pursuits very uncongenial to the cultivation of the mind, and the attainment of useful knowledge. Take the case of an eminent lawyer in full practice. He passes his days in his office, giving advice to clients, often about the most uninteresting and paltry details of private business, or in arguing over the same kind of business in court; and when it comes night, and he gets home, tired and harassed, instead of sitting down to rest or to read, he has to study out another perplexed cause for the next day, or go before referees, or attend a political meeting and make a speech; while every moment which can be regarded in any degree as leisure time, is consumed by a burdensome correspondence. Besides this, he has his family to take care of. It is plain that he has no more leisure for the free and improving cultivation of his mind, independent of his immediate profession, than if he had been employed the same number of hours in mechanical or manual labour. One of the most common complaints of

professional men, in all the professions, is, that *they* have no time to read; and I have no doubt there are many such, of very respectable standing, who do not, in any branch of knowledge not connected with their immediate professions, read the amount of an octavo volume in the course of a season.

There is also a time of leisure, which Providence, in this climate, has secured to almost every man, who has any thing which can be called a home—I mean *our long winter evenings.* This season seems provided, as if expressly, for the purpose of furnishing those who labour with ample opportunity for the improvement of their minds. The severity of the weather, and the shortness of the days, necessarily limit the portion of time which is devoted to out-doors' industry; and there is little to tempt us abroad in search of amusement. Every thing seems to invite us to employ an hour or two of this calm and quiet season, in the acquisition of useful knowledge and the cultivation of the mind. The noise of life is hushed,—the pavement ceases to resound with the din of laden wheels, and the tread of busy men,—the glaring sun has gone down, and the moon and the stars are left to watch in the heavens over the slumbers of the peaceful creation. The mind of man should keep its vigils with them; and while his body is reposing from the labours of the day, and his feelings are at rest from its excitements, he should seek, in some amusing and instructive page, a substantial food for the generous appetite for knowledge.

If we needed any encouragement to make these efforts to improve our minds, we might find it in every page of our country's history. Nowhere do we meet with examples, more numerous and more brilliant, of men who have risen above poverty and obscurity, and every disadvantage, to usefulness and an honourable name. Our whole vast continent was added to the geography of the world by the persevering efforts of an humble Genoese mariner, the great Columbus, who, by the steady pursuit of the enlightened conception which he had formed of the figure of the earth, before any navigator had acted upon

the belief that it was round, discovered the American continent. He was the son of a Genoese pilot, a pilot and seaman himself; and, at one period of his melancholy career, was reduced to beg his bread at the doors of the convents in Spain. But he carried within himself, and beneath an humble exterior, a spirit, for which there was not room in Spain, in Europe, nor in the then known world; and which led him on to a height of usefulness and fame, beyond that of all the monarchs that ever reigned.

The story of our Franklin cannot be repeated too often,—the poor Boston boy,—the son of an humble tradesman, brought up a mechanic himself,—a stranger at colleges, till they showered their degrees upon him,—who rendered his country the most important services in establishing her independence,—enlarged the bounds of philosophy by a new department of science,—and lived to be pronounced, by Lord Chatham in the British house of Peers, an honour to Europe, and the age in which he lived.

Why should I speak of Green, who left his blacksmith's furnace to command an army in the revolutionary war,—the chosen friend of Washington, and next to him, perhaps, the military leader who stood highest in the confidence of his country?

West, the famous painter, was the son of a Quaker in Philadelphia: he was too poor at the beginning of his career to purchase canvass and colours; and he rose, eventually, to be the first artist in Europe, and president of the Royal Academy at London. Count Rumford was the son of a farmer at Woburn: he never had the advantage of a college education, but used to walk down to Cambridge to hear the lectures on Natural Philosophy. He became one of the most eminent philosophers in Europe,—founded the Royal Institution in London,—and had the merit of bringing forward Sir Humphrey Davy, as the lecturer on chemistry in that establishment. Robert Fulton was a portrait-painter in Pennsylvania, without friends or fortune. By his successful labours in perfecting steam navigation, he has made him-

self one of the greatest benefactors of man. Whitney, the son of a Massachusetts farmer, was a machinist. His cotton-gin, according to Judge Johnson, of the Supreme Court of the United States, has trebled the value of all the cotton lands at the South, and has had an incalculable influence on the agricultural and mechanical industry of the world. Whittemore of West Cambridge, the person who invented the machinery for the manufacture of cards, possessed no other means of improvement than those which are within the reach of every temperate and industrious man. Several in this audience were probably acquainted with the modest and sterling merit of the late Paul Moody. To the efforts of his self-taught mind, the early prosperity of the great manufacturing establishments at Waltham and Lowell is in no small degree owing. I believe I may say with truth, that not one of these individuals enjoyed, at the outset, superior opportunities for acquiring useful knowledge to those in the reach of every one who hears me.

These are all departed; but we have living among us illustrious instances of men, who, without early advantages, but by the resolute improvement of the few opportunities thrown in their way, have rendered themselves, in like manner, useful to their fellow-men,—the objects of admiration to those who witness their attainments, and of gratitude to those who reap the fruit of their labours.

On a late visit to New Haven, I saw exhibited a most beautiful work of art—two figures in marble, representing the affecting scene of the meeting of Jephthah and his daughter, as described in the Bible. The daughter, a lovely young woman, is represented as going forth with the timbrel in her hand to meet her father, as he returns in triumph from the wars. Her father had rashly vowed to sacrifice to the Lord the first living thing which he should meet on his return; and, as his daughter runs forth to embrace him, he rends his garments, and turns his head in agony at the thought of his vow. The young maiden pauses, astonished and troubled at the strange reception. This pathetic scene

is beautifully represented in two marble figures of most exquisite taste, finished in a style which would do credit to a master in the art. They are the work of a self-taught artist at New Haven, who began life, I have been informed, as a retailer of liquors. This business he was obliged to give up under a heavy load of debt. He then turned his attention to carving in wood; and, by his skill and thrift in that pursuit, succeeded in paying off the debts of his former establishment, to the amount of several thousand dollars. Thus honourably placed at liberty, he has since devoted himself to the profession of a sculptor; and, without education, without funds, without instruction, he has risen at once to extraordinary proficiency in this difficult and beautiful art, and bids fair to enrol his name among the brightest geniuses of the day.

I scarce know if I may venture to adduce an instance nearer home, of the most praiseworthy and successful cultivation of useful knowledge, on the part of an individual, without education, busily employed in mechanical industry. I have the pleasure to be acquainted, in one of the neighbouring towns, with a person who was brought up to the trade of a leather-dresser, and has all his life worked, and still works, at this business. He has devoted his leisure hours, and a portion of his honourable earnings, to the cultivation of useful and elegant learning. Under the same roof which covers his store and workship, he has the most excellent library of English books, for its size, with which I am acquainted. The books have been selected with a good judgment, which would do credit to the most accomplished scholar, and have been imported from England by himself. What is more important than having the books, their proprietor is well acquainted with their contents. Among them are several volumes of the most costly and magnificent engravings. Connected with his library is an exceedingly interesting series of paintings, in water colours, which a fortunate accident placed in his possession, and several valuable pictures purchased by himself. The whole forms a treasure of taste and

knowledge, not surpassed, if equalled, by any thing of its kind in the country.

I should leave this part of my address too unjustly defective, did I not add, that we possess, within our own city, an instance of merit, as eminent as it is unobtrusive, in the person of one who has raised himself, from the humblest walks of life, to the highest scientific reputation. Little, perhaps, is it known to the intelligent mariner, who resorts to his Practical Navigator for the calculations with which he finds his longitude in mid-ocean, that many of them are the original work of one who started at the same low point in life with himself. Still less is it known to him that this was but the commencement of a series of scientific productions, which have placed their author upon an equality with the most distinguished philosophers of Europe, and inscribed the name of Bowditch with those of Newton and La Place, upon that list of great minds, to which scarcely one is added in a century.

But why should I dwell on particular instances? Our whole country is a great and speaking illustration of what may be done by native force of mind, uneducated, without advantages, but starting up under strong excitement into new and successful action. The statesmen, who conducted the Revolution to its honourable issue, were called, without experience, to the head of affairs. The generals, who commanded our armies, were most of them taken, like Cincinnatus, from the plough; and the forces which they led were gathered from the firesides of an orderly and peaceful population. They were arrayed against all the experience, talent, and resource of the elder world—and came off victorious. They have handed down to us a country—a constitution—and a national career, affording boundless scope to every citizen, and calling every individual to do for himself, what our fathers unitedly did for the country. What man can start in life, with so few advantages as our country started with in the race of independence? Over whose prospects can there hang a cloud as dark as that which brooded over the cause of America? Who

can have less to encourage, and more to appal and dishearten him, than the sages and chieftains of the Revolution? Let us, then, endeavour to follow in their steps, and each, according to his means and ability, try to imitate their glorious example,—despising difficulties, grasping at opportunities, and steadily pursuing some honest and manly aim. We shall soon find that the obstacles which oppose our progress, sink into the dust before a firm and resolute step; and that the pleasures and benefits of knowledge are within the reach of all who seek it.

There are a few considerations, which I beg leave more particularly to address to the younger part of the audience, and which seem to call on them peculiarly, with a loud voice, to exert themselves, according to their opportunities, to store their minds with useful knowledge.

The world is advanced to a high point of attainment in science and art. The progress of invention and improvement has been, especially of late years, prodigiously rapid; and now, whether we regard the science of nature or of art, of mind or of morals, of contemplation or of practice, it must be confessed that we live in a wonderfully improved period.

Where is all this knowledge?—where does it dwell? In the minds of the present generation of men. It is, indeed, recorded in books, or embodied in the various works and structures of man. But these are only the manifestations of knowledge. The books are nothing till they are read and understood; and then they are only a sort of short-hand, an outline, which the mind fills up. The thing itself, the science, the art, the skill, are in the minds of living men—of that generation which is now upon the stage.

That generation will die and pass away. This hour which we have spent together, has been the last hour to many thousands throughout the world. About three thousand of our race have died since I began my lecture. Among them, of course, is a fair proportion of all the learned and the wise in all the nations. In thirty

years all now living will be gone, or retired from the scene, and a new generation will have succeeded.

This mighty process does not take place at once, either throughout the world, or in any part of it; but it is constantly going on—silently, effectually, inevitably; and all the knowledge, art, and refinement now in existence, must be either acquired by those who are coming on the stage, or it perishes with those who are going off, and is lost for ever. There is no way by which knowledge can be handed down, but by being learned over again; and of all the science, art, and skill in the world, so much only will survive, when those who possess it are gone, as shall be acquired by the succeeding generation. All the rest must perish.

The rising generation is now called upon to take up this mighty weight,—to carry it along a little way, and then hand it over, in turn, to their successors.

The minds which, in their maturity, are to be the depositories of all this knowledge, are coming into existence every day and every hour, in every rank and station of life,—all equally endowed with faculties,—all, at the commencement, equally destitute of ideas,—all starting with the ignorance and helplessness of nature,—all invited to run the noble race of improvement. In the cradle there is as little distinction of persons as in the grave.

The great lesson which I would teach you is,—that it depends mainly on each individual what part he will bear in the accomplishment of this great work. It is to be done by somebody. In a quiet order of things, the stock of useful knowledge is not only preserved but augmented; and each generation improves on that which went before. It is true, there have been periods in the history of the world, when tyranny at home, or invasion from abroad, has so blighted and blasted the condition of society, that knowledge has perished with one generation, faster than it could be learned by another; and whole nations have sunk from a condition of improvement, to one of ignorance and barbarity, sometimes in a very few years. But no such dreadful catastrophe is

now to be feared. Those who come after us will not only equal, but surpass their predecessors. The existing arts will be improved,—science will be carried to new heights,—and the great heritage of useful knowledge will go down unimpaired and augmented.

But it is all *to be shared out anew;* and it is for each man to say what part he will gain in the glorious patrimony.

When the rich man is called from the possession of his treasures, he divides them as he will among his children and heirs. But an equal Providence deals not so with the living treasures of the mind. There are children just growing up in the bosom of obscurity, in town and in country, who have inherited nothing but poverty and health, who will, in a few years, be striving in stern contention with the great intellects of the land. Our system of free schools has opened a straight way from the threshold of every abode, however humble, in the village or in the city, to the high places of usefulness, influence, and honour. And it is left for each, by the cultivation of every talent,—by watching, with an eagle's eye, for every chance of improvement,—by bonnding forward, like a greyhound, at the most distant glimpse of honourable opportunity,—by grappling, as with hooks of steel, to the prize when it is won,—by redeeming time, defying temptation, and scorning sensual pleasure, to make himself useful, honoured, and happy.