THE VALUE OF INSTRUCTION IN THE MECHANIC ARTS

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AN ADDRESS

BEFORE THE AMERICAN INSTITUTE OF THE CITY OF NEW YORK
ON WEDNESDAY EVENING, OCTOBER SECOND, 1889

BY

L. E. CHITTENDEN

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A CONDENSED HISTORY

OF THE

AMERICAN INSTITUTE

OF THE CITY OF NEW YORK

AND ITS

EXHIBITIONS

A FEW enterprising citizens in the year 1828 met in a small room in Tammany Hall and organized the American Institute, and in 1829 a charter was granted by the Legislature of the State of New York, under the title of the "American Institute of the City of New York."

Its objects are to encourage and promote domestic industry in this State, and the United States, in Agriculture, Commerce, Manufactures and the Arts, and any improvements made therein, by bestowing rewards and other benefits on those who shall make such improvements, or excel in any of the said branches.

Mr. Thaddeus B. Wakeman was very prominent as one of its founders, in fact, might be styled it father, and was its Corresponding Secretary for many years. He died in 1848. The Institute, to mark its appreciation of his services, erected a monument to his memory in Greenwood Cemetery.

One of the principal means to accomplish its objects was the holding of Exhibitions, or as they were then called, Annual Fairs, in which Inventors, Manufacturers and others, could exhibit their various productions.

The first Fair was held in 1828 in Masonic Hall, then standing on Broadway, nearly opposite the New York Hospital, at the head of Pearl Street. The Hon. Edward Everett, of Boston, delivered the anniversary address, which was a masterpiece of oratory. It was afterwards published and passed through a second edition.

This Exhibition was very successful, and after holding six Fairs there, it was found necessary to secure more ample accommodations. After examining various locations, Niblo's Garden was selected, notwithstanding great doubts were expressed as to its accessibility, it being deemed by many too far out of town. The Fair, was, however, well patronized that year, and the Exhibitions became very popular until the place was consumed by fire in 1846.

Castle Garden, on the Battery, then a fashionable resort for our citizens, was next selected, and the Fairs were held there every Fall until 1853.

The Exhibition of the Industry of all Nations was opened in the Crystal Palace in 1854, on Reservoir Square, in Sixth Avenue, between Fortieth and Forty-second Streets. After its close the American Institute procured it for holding its Exhibitions, which were held there in 1855, '56, '57 and '58, when it was destroyed by fire on the afternoon of October 5, 1858, with all its contents. This was a severe loss to the American Institute, and was thought by some to be its death blow. Notwithstanding this disaster, the managers held an Exhibition the next year in Palace Garden, in Fourteenth Street, on the same lots on which now stands the Armory of the Twenty-second Regiment. The Institute, at great expense, made many improvements in that building, and held Fairs in it for several years.

In 1863, the Exhibition was held in the Academy of Music, Fourteenth Street and Irving Place.

In 1869, the Institute secured the large structure on Third Avenue, between Sixty-third and Sixty-fourth Streets. This building had been erected for a Skating Rink; to this the Institute have added three large buildings, the whole covering forty city building lots, extending from Third to Second Avenues.

Many modest men, who would have remained in obscurity, have made fortunes in having their skill and ingenuity brought prominently before the public by the great facilities afforded them by the American Institute.

The Exhibitions are held under the direction of a Board of Managers, elected annually by the members.

The articles on exhibition are classified under seven departments, which are again divided into seven groups. The classifications are as follows:

1. *Department of Fine Arts and Education.*
2. *Department of the Dwelling.*

3. *Department of Dress and Handicraft.*
4. *Department of Chemistry and Mineralogy.*
5. *Department of Engines and Machinery.*
6. *Department of Intercommunication.*
7. *Department of Agriculture and Horticulture.*

In connection with the Fairs, the American Institute has held eighteen Exhibitions of Live Stock from 1838 to 1859, the Exhibitions of 1857 and 1858 were confined to Fat Cattle.

These Exhibitions were held for some years on the ground on which the Fifth Avenue Hotel now stands; it was then out of town. On this ground stood a famed hostelry, known as Madison Cottage, kept by CORPORAL THOMPSON; this was the stopping place for the Broadway stages.

The Cattle Shows were also held on Hamilton Square, and on Hamilton Park, in Third Avenue.

In addition to its valuable Scientific Library, there are three sections, viz.:

1st. The Farmers' Club, under the direction of the Committee on Agriculture, which meets the second and fourth Tuesdays, at 1.30 o'clock, P. M., at its rooms in Clinton Hall.

2d. The Polytechnic, under the direction of the Committee on Manufactures and Machinery, which discusses Scientific Subjects, the examination of New Inventions, etc.; it meets at the same place every Thursday, at 7.30 o'clock, P. M.

3d. The Photographic Section, under the direction of the Committee on Chemistry and Optics, which discusses all matters in relation to Photography and the action of light—this Section meets at the same place on the first Tuesday of each month, at 8 o'clock, P. M.

All these meetings are open to the public.

The present number of members is about 2,000.

The Institute is governed by a Board of Trustees consisting of thirteen members, of which the President, two Vice-Presidents, and two members are retired and elected annually.

The Institute is now holding its Fifty-eighth Annual Exhibition.

CHAS. WAGER HULL is the General Superintendent, and JOHN W. CHAMBERS is the Secretary of the Board of Managers, a position he has filled for fifty-five years.

THE

AMERICAN INSTITUTE

OF THE CITY OF NEW YORK

INCORPORATED 1829.

"FOR THE PURPOSE OF ENCOURAGING AND PROMOTING DOMESTIC INDUSTRY IN THIS STATE AND THE UNITED STATES, IN AGRICULTURE, COMMERCE, MANUFACTURES AND THE ARTS."

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NEW YORK CITY, October 22, 1889

HON. L. E. CHITTENDEN,

DEAR SIR:

The Board of Managers of the Fifty-eighth Annual Fair, at their meeting, held on Tuesday, October 8th, by a unanimous vote, requested a copy of the address delivered by you on the opening of the present Exhibition, the 2d inst, for publication.

Very respectfully,

DANIEL R. GARDEN,

Secretary *pro tem.*

137 Broadway,
New York, October 24, 1889

Gentlemen:

In compliance with the request in your note of the 22d inst., I herewith send you the address to which it refers. I have frankly stated to you why I do not think the address worthy of publication. It was necessarily prepared in the intervals of business, and in so short a time that no reference to authorities was practicable. Such conditions were not favorable to the discussion of its subject with the care and thought which its importance demanded. But if, after further examination, you determine upon its publication, I shall consent, with regret that I have been unable to make it more worthy of a permanent record.

I have another apology to make. The time required for the delivery of the address was protracted by unexpected demonstrations of approval by the audience. To compensate for this loss I omitted the reading of the concluding paragraphs, without at the moment appreciating that they comprised the only reference to the proposed Exposition of 1892. To show that the omission was my own and not the fault of the managers, I request that the conclusion of the address be published as it was prepared for delivery. I am, gentlemen,

To the Board of Managers of the
American Institute,
Daniel R. Garden, Esq.,
Secretary *pro tem.*

Yours cordially,
L. E. Chittenden.

THE VALUE OF INSTRUCTION IN THE MECHANIC ARTS

Mr. President, Managers and Members of the American Institute, Ladies and Gentlemen:

WHEN only four days ago, your managers invited me to make this opening address, I was about to decline their invitation on the double ground of want of time for preparation, and want of an adequate knowledge of the purposes of your incorporation. But my eye fell upon this inscription on your cards of admission, "Fifty-eighth Fair of the American Institute of the City of New York, Incorporated for the promotion of domestic industry, in agriculture, commerce, manufactures and the arts." Here was provided a text, if not for one of the long sermons, which edified and wearied us in our youth, at least for that "improvement of the subject" by which those sermons closed.

For that man, lawyer or layman, who cannot find an instructive lesson in such a text, who has not some knowledge which he can impart to others, of the debt which our generation owes to manufactures and the mechanic arts, is ignorant beyond the common lot of man. I shall endeavor to show something of the educational value of these arts, and of the rich promise of interest and profit they are making to the youth of our time. The subject is broad and attractive—my regret is that I cannot treat it in a manner worthy the audience and the occasion.

We know that there has been a pre-historic period of great development in the mechanic arts, of which only the product survives. How those huge columns, those gigantic monoliths were cut from the quarries of Syene—raised upon the sands of the desert, with records cut deep into their stone faces; how the great tombs were excavated in the granitic mountains of Egypt, how jade, the densest mineral known except the diamond, was carved into those many forms of exquisite beauty, when steel and iron were unknown, and

the best cutting edge was of bronze ; these and many other questions of equal importance call for answers which cannot be given ; are mysteries for which neither history nor science has any satisfactory explanation.

Within the historic period there could not be much development of these arts so long as war was the chief end of man. That was the proper age of steel. Its weapons were miracles in metals. The legendary swords of King Arthur, of Wieland Smith and Siegfried the dragon-slayer, were not more wonderful than the blades of Damascus, or that terrible weapon which conquered the world, the Roman Sword. From the time when the fierce energy of the Scandinavian blood mingled with the more stagnant fluids of the Latin races, after the fall of imperial Rome, the mechanic arts drooped and sickened, and what we call the middle ages were almost passed before there were any substantial evidences of their revival.

The world is indebted to the priest and the monk for the impulse that awoke the mechanic arts out of their sleep of centuries. Their earliest exhibition of improvement was in the plastic arts, in painting and in architecture. Those who think of the monks only as lazy parasites, feeding their pampered appetites upon the fruits of the labors of an ignorant peasantry, or of the Church as saturated with corruption, forget those paintings before which generations have stood entranced—those virgins, saints and holy families, which were the creations of Fra Angelico—the "angelic brother." It was when abbeys and monks were most numerous that architecture reached a perfection which it has never since attained. What glorious structures were those English Abbeys, destroyed by Cromwell, the ruins of which attract the admiration of thousands of annual travellers ! What noble monuments to their cowled designers were those imposing cathedrals with their lofty spires, their arches of unapproachable grandeur and their artistic ornamentation ? But from pointed spire to foundation stone they were the creations of the Brothers of St. Augustine, St. Francis or St. Dominick. Now and then in a few places, great masters appeared, not always officially connected with the Church. But they worked for the Church which preserved their works. Such great masters were Adam Kraaft, Peter Vischer and Albert Durer in Nuremberg, and those unknown artists in stone who built the thirteen arches and carved the "Prentice's pillar" in the chapel of Roslyn. I have no sympathy with that prejudice which denies to the Church, credit for its good influences, and is always on the hunt for its errors. It was the Church that

kept the mechanic arts alive during the centuries of the darkest period of human history. All art of that time was Christian. That most exquisite structure ever reared by human hands the Sainte Chapelle, in Paris, was built by St. Louis of France, to preserve the relics of the true Cross. By the common judgment of mankind it far excels as a monument of architecture the mosque of Saladin or the tomb of Taj Mahal. And this wonderful structure with its beautiful ornamentation was wholly the conception of a Christian mechanic of the Thirteenth Century.

The first great modern advance in the mechanic arts covers the inventing of engraving and printing. These again are the products of the Church. It had its unworthy members, possibly they are the most conspicuous in history. But it also had its faithful, simple priests who went from village to village, from peasant hut to castle, teaching the poor and the ignorant great truths out of the Old Testament and the Gospels. They found these truths more permanent when addressed to the eye than to the ear. A picture, however rude, of the Nativity or the Crucifixion, was remembered when the relations of Luke and Matthew were forgotten. How were these pictures to be multiplied for general distribution? The artist and the mechanic were called to the work, and out of the rude products of the stencil-plate, they developed the great art of engraving—that useful, educating art which in our day has so wide an application. Then readers increased and the scribes could not produce manuscript Missals and Bibles rapidly enough to supply the demand. The genius of the mechanic was again called into action, and the great art of printing with movable types was born. So perfect was it that experts pronounced it the work of the devil. Since such work could not be produced by human, it must be by Satanic hands!

Time does not permit, nor is it necessary to our purpose even to sketch the further development of the mechanic arts. Enough has been said to indicate the smallness of their beginnings, and the narrow circle which circumscribed their development, until a comparatively recent period. That circle, was the circle of Christian, of Catholic Christian influence. Having awarded to the Church due credit for its conservative, progressive work, we may now turn to consider some of the influences of these arts upon our own generation.

I should not waste your evening if I could indelibly impress upon your minds a single but almost infinitely great fact of the present

state of the mechanic arts. It is their prospective development in the early future. I do not know of any present fact of greater moment, or which will probably produce more radical changes, or exert a more powerful influence upon mankind. It is before us and upon us. Let us give to it a few minutes of our consideration.

We have seen a great development in these arts in our own time, yet the promise of their future development was never so great as now. Discoveries and inventions in them have been very numerous in the recent past; they will be more numerous in the early future. I believe it is demonstrable, that they are now opening to the enterprising and industrious of both sexes of the coming generation a field of usefulness, interest and pecuniary profit, larger and more inviting than all the professions combined with all the other departments of human industry.

There are persons in this audience who would object if you called them old, who remember the first invention of the cooking-stove—when they studied "Webster's Spelling Book" by the light of the tallow candle made by their mothers, who carded and spun and wove into cloth the wool and flax in which they were clothed—when farmers and farmers' wives ridiculed machinery, and themselves performed all the work of the dairy and the farm—when our fastest mails moved only seventy miles a day, and the canal packet and stage were the speediest means of travel—when the emigrant to the "Oswego Country," then the "Far West," called his relatives together and bade them a tearful farewell, for he never expected to see them again—when he who had safely returned from Europe was a mighty traveller, who had possibly heard the great English scientist declare that no ship could possibly carry fuel enough to impel it by steam across the Atlantic Ocean!

War is supposed to avail itself of the best means of destruction or defense. Yet at the beginning of our civil strife, except a few revolvers for the cavalry, there was not a breech-loading arm in the service—three miles was the longest range of cannon, and high explosives were unknown. Forts with brick walls were adequate seacoast defenses, and the Chief of Ordnance in our War Department angrily declared that the old Springfield musket, with its flint changed to a percussion lock, was the best arm that could be placed in the hands of a volunteer!

We have lived to see great changes. What are usually called two great forces running wild in the domains of nature have been caught and harnessed to the car of human progress. We call them

Electricity and Steam. They have revolutionized the world of productive labor. They do almost all our work. With delicate fingers they seize the fibre of plant or animal, and through a thousand processes change it into clothing for our bodies and into a multitude of forms useful to man. With the strength of giant arms they tear the ores of metals from the eternal rocks below, elevate them to the surface, and through roaring furnace, resounding hammer, revolving lathe and a thousand other means, turn them into engines which move man and the products of the earth over valley and mountain, across land and sea. We teach false doctrine when we call them *two* forces. There is but one force in nature. He was a great scientist as well as a great lawyer who first taught us that heat, light and force or power were convertible into each other—that the solar heat imprisoned in the fuel grown in cosmic ages long past, could at our will be converted into whichever of these three forms we might find temporarily useful.

Fuel, then, is the source of all forms of heat, light and power. The art of converting fuel into one of these forms with the greatest economy is the basis of mechanical science—it is almost all there is of mechanical science. This is a great fact which underlies all mechanical progress. Let us inquire whether it is not full of promise for the coming generations of man.

By comparing the great inventions in the mechanic arts since the discovery of the great fact upon which they rest, with what may probably be done in the future, we may measure the field already occupied, and see how much of it remains to be occupied by those who are to follow us. Here the unthoughtful mind will certainly err—its possessor will exclaim that invention finished its work and perished before his time—that so many great inventions have been made that nothing remains to be discovered ! Let us inquire !

True it is, that ours has been a century of inventions. The compound, now the triple expansion marine engine drives steamships of 10,000 tons burden across the Atlantic in less than six days. By any one of four routes a 50-ton locomotive draws a passenger train across the continent in less than that number of days. There is not a civilized port or city on the globe with which we cannot communicate by telegraph in forty-eight hours. Over the telephone we converse with our friends 1,500 miles away. That wonderful art of dividing a current of electricity brings that beautiful illuminator, the incandescent light, into our dwellings and our offices. Steam performs almost all our labor. The application

of high and smokeless explosives will soon make wars so destructive that "nation shall not lift up sword against nation, neither shall they learn war any more." Old methods of business are superseded ; the merchant of the last century lives only in history. Electricity is becoming almost as common in its daily uses as steam. Yet with all these great inventions and changes, every one of which depends on the consumption of fuel, economy in which is the one object to be attained (except possibly the latest form of the marine engine), there is no form of using fuel known in mechanics, no machine yet invented to save the labor of man which does not waste five parts of fuel for every one that it utilizes, and the best modern locomotive wastes more than nine out of every ten pounds of fuel it consumes.

Let a young mechanic go to the top of a high building in this city on a frosty morning. All around him he will see countless jets of steam darting upwards and vanishing in the air. They show where the equally numerous steam engines are preparing for the labors of the day. And every one of those steam jets is a fountain of power and heat going to waste. In the exhaust steam blown into the air, there is heat enough wasted to warm every building in the city, and a quantity of force of great value.

There is the subject of mining and the treatment of metallic ores, always associated with human greed, always attractive to the mechanical inventor. There have been countless improvements and supposed improvements in it—it is the prevailing industry in several of our states and territories ; there have been inventions in its processes, some of them supposed to be valuable, most of them worthless. But with all the inventions some of the identical processes for the reduction of these ores of two thousand years ago are in use to-day. The slaves of the Cæsars in the Iberian mines pounded their ores to the requisite fineness for amalgamation with stamps of the same general pattern as those which are still pounding away in the hills of Colorado and along the metallic belt of the Continent. The writings of Agricola long existed in manuscript. They were first printed in book form in 1555. In the first folio of "De Re Metallica" you will find a mining plant figured which is reproduced in thousands of the mines of our day. It cannot be true, I think, that the rude and cumbrous stamp which crushes the rock by gravity alone is the only possible or the cheapest method of reducing these ores to the requisite fineness. The mechanic who will invent a way of doing it by machinery of quick action is sure of fortune and a conspicuous place in future history.

A few years ago that valuable metal, aluminium, the base of clays, and more universally distributed than any metal except iron, cost as much per ounce as silver. It could only be procured from an ore brought from Greenland and by a most expensive process. It is the lightest of metals, does not oxidize, has the color of silver and great tensile strength. At the cost of iron its uses would be innumerable. A slight admixture of it renders cast-iron malleable. Very recent applications of electricity have greatly cheapened its production. There is still room for the improvements which will reduce its cost to $20 per ton. We buy Bessemer steel for $30 per ton. Our children will buy it for $15. But to that end we must utilize the scores of mines producing Bessemer ores, now idle because the percentage of iron in their ores is too small to bear transportation without concentration. Where is the future inventor who will devise a cheap means of crushing and concentrating: of separating these ores from the worthless rock so that it will pay to send them to every furnace in the land? Some insist that the invention is already made. If it is, the inventor will enrich the owners of these mines which are now idle, and he too will become a public benefactor.

I can only mention one more of the ways to wealth and fortune now open to the diligent student of the mechanic arts. Some of us remember the discovery that electricity had any value as a force that could be utilized, when the inquiry, "What hath God wrought?" first flashed over a metallic circuit which connected Baltimore and Washington. Two great events in electricity have since happened—the discovery of the ground circuit, and the division of what is called the electric current. It has given us a new science of electric illumination, with that most lovely of all forms of light, the incandescent. There has since been a wondrous development of the uses of electricity. Distance in communication scarcely exists. The telephone has reversed old methods of business. The actual uses of electricity are too numerous to be stated here, its possible uses are as countless as the wants of man. Yet the science of electricity is in its veritable infancy. We know electricity only by a few of its properties. We can handle it, see it, feel it. We know that it is heat, light, force; that it pervades all nature as completely as the heat of the sun. We know that certain mechanism under special conditions either collects or produces it. But here is the limit of our present knowledge. The question, What is electricity? is beyond the bounds of present knowledge. We can

no more answer it than we can answer the question, *What is Life?*

This imperfect and rather incoherent statement of only a few well known facts suggests the inferences I would draw from the present situation. If we can utilize only an inconsiderable fraction of the value of fuel—if our commonest processes are so prodigally wasteful—if inventions in the oldest and best known departments of mechanics, only serve to show how much still remains to be done—if electricity, which promises the strength of a giant in its manhood, is still in its swaddling clothes, what a promising, limitless field of labor now is opening to the diligent student, the industrious worker in the mechanic arts? If with limited knowledge and opportunity so much has been accomplished, what may we not hope from an increased knowledge and multiplied opportunities? I look confidently to the early future for the greatest development of these arts the world has ever seen, for a new era of discovery and invention, for a vast increase of human comforts, a mighty aggregate of human happiness. And therefore I believe these same mechanic arts are the most promising subjects of work and study that can be set before the young men and young women of our time. They are now giving continuous and profitable employment to the youth of both sexes; they are capable of furnishing similar employment to as many as will submit to the conditions of their service, to their yoke which is easy and their burden light.

We have lived in a favored age. Political economists teach that what is called "the filling up period" is the most fortunate in a nation's life. Such a period has been ours. Our Republic has been free; our territory stretching from ocean to ocean, has comprised a broad area of most fertile lands. We have been overgenerous with them. We have opened our doors, perhaps too wide, and have welcomed immigration on possibly too liberal a scale. At all events our fertile lands are substantially occupied and "our filling up period" touches its close. Employments opened to our children will be closed to our children's children. "Go West, young man," no longer shows the way to station and fortune. The farmer on the mountain slopes of the East will no longer be able to improve his wealth by a mere change of location, the cultivation of the soil will become more limited in area and its results less profitable, and the masses of the future must find other means of subsistence.

Our Republic comprises only two classes of producers; those

who cultivate the soil and gather its products, and those who turn the native or cultivated products of the soil into forms useful to man. The first are the cultivators or farmers : the second are the mechanical workmen. Other classes are useful ; the professional, the educational, those who make and administer the laws, are indispensable to a well-ordered society. The producers may increase without limit for they maintain themselves ; but if the useful non-producers are multiplied beyond the limit of necessity, they become a dead weight upon the producing classes. In a well-ordered society there should be watchfulness against the overcrowding of these classes, whilst in the ranks of the producers there is room for all.

And there is a great army of non-producers who have little or no value in society, although their avocations are in a sense reputable. The great army of middle men interposed between the producer and the consumer—another great army of men who, failing in recognized pursuits and having no regular business, call themselves brokers—the horde of speculators who swarm in the exchanges, all these who neither toil nor spin—must live upon those who do. When to these are added those who live by the trade of politics and their henchmen—those who patronize equally the race course and the saloon—the army of saloon keepers and venders of beer, and the greater army of the idle, the vicious and the criminal classes—when all these are enumerated we begin to appreciate what a mighty host of practical mendicants, or useless, injurious members of society all live upon the small minority of producers. Besides those whom the producer is required by family and social obligations to maintain, he supports an equal number of the useless, or worse than useless, non-producing classes.

But for progress in the arts of production the producers could not carry their burden. For these useless classes have enormously multiplied in our time. Their increase must be arrested and their numbers diminished, or they must become tramps or starve.

Improvements in machinery during the last half century have largely increased the products of labor. Almost the entire work of the farmer is now done by machinery or improved farming tools ; the same may be said of manufactures of every class. Yet the common laborer never earned such wages, never enjoyed such comforts as now. It is a heresy and a falsehood to assert that the laborer is injured by improvements in machinery—they have proved his greatest blessing.

If then our country is best served when its capacity for production is increased, and its producers made influential, it seems to follow that there is no higher form of patriotism than that which makes the mechanic arts attractive and encourages their study by the young. This Institute requires no praise from me. Its works do praise it, continued now through more than fifty years. But in passing I cannot omit saying that the rules which govern your awards, and which, therefore, indicate the principles upon which the institute is conducted, appear to me to be models for the encouragement of the mechanic. I should feel that I had done great injustice to the opportunity and to myself, if I did not endeavor to increase the measure of that encouragement by my words.

In all the range of politics there is no demagogism worse than that which teaches that capital and labor are inimical—which would array one against the other. It cannot be called a devilish doctrine, for the devil is scarcely a fool; and he is a fool incapable of comprehending the interest of labor or the uses of capital who cannot see that they ought to be friends.

The mechanic who thinks as he works, whose mind weighs the difficulties he has to overcome, often becomes an inventor. Such men abound in this city, they have the very highest interest in comprehending the just and equitable relations between labor and capital. He will make a mistake fatal to his success, who undervalues capital or fails to concede to it its full deserts. On the other hand capital may lose its best opportunities of investment if it does not admit the full value of the inventive faculty, especially when it shows itself in the mind of the ordinary mechanic.

We may look for a great increase of new and useful inventions in the early future. My evening would be profitably employed if I could influence capital to come to the assistance of these inventions, to aid in bringing them into public use upon equitable conditions. I cannot enforce my own views upon this subject better than by relating an actual occurrence, which I hope may make as permanent an impression on your minds as it did upon my own.

One of the most experienced men of business I ever knew was for many years largely interested in the improvement, manufacture and sale of the sewing machine. His connection with it began with the invention of the eye-pointed needle—covered that long period of time when the mind of almost every inventor was upon that machine, and when sewing-machine patents multiplied at the rate

of a thousand a year. He had been experienced in every aspect of patent litigation, and had made his fortune by the judicious purchase and exploitation of patented inventions. I asked him what, in his opinion, was the money value of an average patented invention compared with the cost of its introduction into public use? His answer was that, as a rule, there were three eras in the life of a valuable patent—the era of experiment—of litigation—and of successful use. These, he said, would average about five years each. The inventor might think his invention perfect, but when submitted to the test of practical use, it almost invariably developed imperfections which could only be obviated by experiment. The more valuable a patent was, the more certain it was to be contested. In the average of patents in which he had been interested, two-thirds of the time covered by the patent had expired, before any profits were realized. The most valuable improvement then possible to be made in a sewing machine, would have no value which could be realized, until it had a half million of dollars put behind it. An inventor, he continued, who can find a capitalist who will agree to bear the cost of bringing his invention into public use, will always make a good bargain, if he can obtain the capital by parting with half his invention—and the more valuable his invention, the better for him will be his bargain. The answer to your question, then, is, "one half the invention to the capitalist, the other half to the inventor." My own observation since, has confirmed the accuracy of his judgment.

I knew another inventor who had invented an automatic tension for a sewing-machine. A machine which is to be operated by a great number of persons of all degrees of mechanical knowledge, is weak in proportion as its operation depends upon the operator's judgment. For years the tension had been the weak point in the sewing-machine. Its tension of the thread was regulated by the turning of a screw. The directions might be as minute as possible. B. would turn the screw a little farther than, or not quite so far as A. In A.'s hands the machine was a success, in B.'s it would not operate at all. The inventor who could take this tension from the judgment of the operator and make it automatic would make a most valuable invention.

This inventor carried his device to one of the large companies for trial. After working some months and expending some thousands of dollars, the machinist reported in its favor and the company decided to adopt it, if the inventor would accept a

reasonable license fee. Had he been content with a fee of ten cents a machine his invention would have been adopted, and in a few years have earned him a fortune. But this inventor was making haste to be rich—he demanded a fee of five dollars a machine, and would accept no less. His demand was rejected and his patent has never since been heard of. Automatic tensions were invented by others, and he sank into obscurity.

There are possibly employers here, who need to be reminded of some duties which the prudent employer will find it to his interest not to neglect. If the inventive faculty exists in any of his workmen, he should cultivate it with the greatest care. Invention results from genius which always hungers for sympathy, and is subject to depression. If you have such a workman, take him into your confidence, interest yourself in his family, ascertain his circumstances and encourage his labors. Such treatment will pay you better than any other investment. In some respects inventors are weak. I never knew an inventor who was at the same time a good business man. You can supply his deficiencies in that particular. I once heard an inventor speak of the debt he owed to Peter Cooper for his counsel and assistance in the matter of a patented invention. Such reverential affection I never heard one man express for another. If every employer of labor was a Peter Cooper there would be few differences with laborers, and strikes would be unknown. Above all, do not deprive a poor inventor of the fruits of his invention. There is no injustice so rankling as that. Remember that poor inventor in Brooklyn a few weeks ago, who in a fit of rage killed his employer, who he believed had unjustly appropriated his invention. I do not believe he was responsible, he rather deserves our pity. Let there be no more such scenes as that.

I have sometimes thought that an Institute like this might perform a great service to mechanical invention, by having a standing committee of conservative, competent men, to which inventors might apply for gratuitous counsel and advice. What should an ordinary mechanic do who believes he has made a valuable invention? I will tell you what scores of them are doing. Their first impulse is to get a patent. Before they know whether their invention has any value at all, they go to the patent solicitor whose work is cheapest and therefore the most worthless. They are always told that their inventions are patentable. The inventor's application is made and rejected. He is assured that it will cost but little to remove the objection. He begins to devote his wages to a useless contest—he

carries it on for a time, and finally, hopeless and discouraged, abandons his application, or sells it to a speculator for a song. I have known valuable inventions thus sacrificed and their inventors ruined. Such a committee as I have named could at least tell an inventor where to go for advice, and prevent his spending money to secure a worthless invention.

I drop these hints, for they are nothing more, because I firmly believe we are now upon the very threshold of a period of great development in the mechanic arts, and that this Institute may be a powerful instrument for good during that period. From time to time the whole inventive faculty working in an army of individuals scattered over all civilized countries, is turned towards a single subject. Just now it is turned upon electricity—the most hopeful subject of invention I think which has ever arisen. That great results may reasonably be hoped for I am sure. That such Institutes as yours should labor to promote those results is a duty which I am equally certain will not be neglected.

With another hint made, possibly, for future reference, I will leave this subject. We have hitherto supposed that electricity generated by the consumption of fuel in some of its multiple forms, moved in currents, the force and intensity of which could be measured. Some of these currents are supposed to be regular, some undulatory, all subject to induction and resistance. Would it not be strange if it should be demonstrated that electrical currents do not exist, that batteries, or fuel in any form are unnecessary—that electricity is an element which pervades nature, and will manifest itself, and will do our work without resistance or induction wherever we establish an artificial circuit for its use? I make no predictions. I simply observe that I should not be surprised by such a discovery.

Returning now to the mechanic arts, what is the lesson of the hour? The cheerful worker is the happiest of men; the idle man is of all the most miserable. He who makes something grow where nothing grew before—he who makes something useful to man which did not before exist, is the true benefactor of his race. Let us then increase the number of these benefactors. Let us have the primary schools in which our boys shall be taught to swing the axe, to shove the plane, to wield the hammer and control the lathe; our girls instructed with deft fingers to touch the key of the telegraph instead of the piano, to work the printing, the knitting and the sewing machine rather than to touch the strings of the banjo and the guitar. Let our boys grow to manhood with capacity to handle

the levers of mighty engines instead of the base-ball bat; our women to read the pages of nature with the eyes of science rather than the pages of the novel or the plates of fashion. Let us build institutions in which men are taught not only manufactures but how to make and operate the machinery which makes manufactures. Let us build nurseries of human independence instead of dissipation and effeminacy. For there is not a skilled worker of either sex who needs to feel hunger or cold, who need be idle for want of employment. Or if a student prefers the vocation of the teacher, let it be a teacher of the useful rather than of the ornamental arts. It is a mark of human progress when our scientific schools are thrown open to both sexes, for their graduates immediately find profitable employment, and it would indeed be a marvel to find a well-educated young mechanic whose services were not in immediate demand.

How almost infinitely brighter, then, are the promises of the future which open to the educated mechanic, taught to labor with his hands, than those of the young professional man. I would that I could honestly encourage the latter, for encouragement is most essential even in the rare cases of his success. But it is better that he should understand his position before he has wasted his life in an unavailing struggle with conditions which he cannot change, and while yet young enough, learn to labor. For never were these professions more overcrowded than at the present moment. There are ten lawyers, doctors and ministers where there is employment for one. Yet our schools where they are so quickly made, go on turning them out by thousands every year. Now and then one succeeds by hard work and real ability—a few more by the assistance or patronage of friends. But with the many the result is pitiable. To live at all, they must employ means and practices which divest these professions of all their dignity, often of their respectability. They cannot marry, because they have no means of maintaining a family—their future prospects are no better—the best they can hope for is a precarious existence, eked out by any description of intellectual, always more wearing than manual labor. What is to happen if this overcrowding of the professions continues? I can see nothing for this great army, with its increasing numbers, but disappointment and failure, and, alas! in too many cases, misery and crime.

I once had my short term of official life. My apology for it is, that I saw my error and ended it by an early resignation. In my

department were many clerkships with salaries ranging from $1,200 to $1,800. These were most attractive to young men, and applications for them were very numerous. As I am growing old it is a great comfort to know that I have not the sin upon my conscience of ever having encouraged a young man to enter the public civil service. On the contrary I never failed to discourage them from it by every means in my power. For there is no more miserable life than that of a government clerk, who just managing to live on his salary has been in office long enough to sever all connections with and wholly to unfit him for success in any of the walks of private life. He has become a dependent on his salary—to lose his office is to starve, and he lives in constant terror of removal.

As I have no such wasted life upon my conscience, so I shall never hereafter fail to advise a young man not to enter the professions, if he is fitted for a life of manual labor. I would advise any young man to avoid Wall Street as he would the pestilence, to keep himself unspotted from politics,* away from the professions and outside the boundaries of public life, and to fit himself for a worker or a teacher of some one of these useful mechanic arts. Here there is no crowding. Here is room enough for all. Here is honor and respect, comfort and happiness with scores of opportunities for celebrity and wealth against one in the professions.

In a struggle against the physical laws of nature or the decrees of its Almighty Ruler, man never wins. The primal curse pronounced against Adam reaches to all his descendants. "In the sweat of thy face shalt thou eat bread until thou return unto the ground." What is this but a sentence of the race to a lifetime of labor? He may eat bread but it must be earned by labor, in other words he must labor to live, for labor is the inevitable condition of his existence. But instead of conforming to this condition, multitudes waste their lives in an effort to escape it. Why do so many of our young men rush blindly into Wall Street, as if a seat in one of the exchanges bought with the credit of their friends was certain to enrich them? It is because they believe that no apprenticeship is required to make one a broker, that here is an employment upon which they can enter without those years of preparation indispensa-

* This and other recommendations of abstention from politics, may imply a meaning very different from that intended. It is the adoption of the trade—of politics as a livelihood, against which I protest. Voting upon election day—registration to secure the right to vote—attendance at primary elections to secure reputable candidates—membership in clubs and other local organizations for political work, are among the highest duties of the citizen. I should condemn my own example if I should seem to excuse the disregard of these obligations.

ble to success in the mechanic arts. If they did not fail of success as they almost invariably do, it would be indeed a miracle.

MANAGERS OF THE AMERICAN INSTITUTE:

You are men of sound judgment. You have been called to your positions because you are experienced in affairs. I appeal to your experience, and I ask you, are not these wholesome truths? Do they not deserve the attention of those who would lead useful lives of honest independence? I have no cause to undervalue my own profession, but if I could live my life over again these great facts point the way I would go. We hear the voice of complaint ascending all around us. It is the voice of disappointed men. They say they have been unlucky, unfortunate, they have not succeeded as well as their neighbors. There is no misfortune without a cause. Men acquire the characters and build up the reputations to which their own acts entitle them. We are what we make of ourselves—the architects of our own fortunes. All men fail who have mistaken their vocations. They mistake their vocations because they enter upon them blindly, without advice of their friends or their own consideration.

In the broad field of the mechanic arts the harvest is indeed plenteous while the laborers are few. It is the field of the Almighty law-giver whose decrees are irresistible, whose commands execute themselves. His decree prohibits idleness and inaction. "Six days shalt thou labor" is addressed to the whole human race. But we have in His inspired word the assurance that "the laborer is worthy of his hire," that "in all labor there is profit," and that "he that gathereth by labor shall increase." We know "that it is easier for heaven and earth to pass away than for one tittle of this law to fail."

The field of labor in the mechanic arts! Was it ever broader or more promising than now? Not the field of ignorant and blind, but of educated and instructed labor! Behold how much of it remains untilled, yes, unexplored; and how inviting is the narrow area with which we are only just beginning to become acquainted! My friends, if I could induce you to accept the counsels dictated by a life of some experience, if I could confer upon you the greatest blessing I can conceive, yes, if I were a monarch who could compel you to obey his mandates and thereby ensure your own success —if I could speak with the authority of silver-tongued Isaiah, I would point you to the highway which leads to the field of educated

industry in the mechanic arts, and my last injunction should be his, *This is the way. Walk ye in it!*

GENTLEMEN OF THE INSTITUTE:

I have already detained you too long, and yet there is one topic that I should not pass in silence. Three years hence will occur the four hundredth anniversary of the discovery of the World of the West. A collection of the products of that discovery should be the grandest spectacle ever seen by human eyes. The opinions of two continents name our City as the appropriate site for its exhibition. It will illustrate our progress, add to our municipal reputation and increase our wealth. There is probably not an individual in our population who has not a pecuniary as well as a patriotic interest in the success of such an exhibition.

Yet we may lose the great opportunity unless our whole people unite in the purpose to secure it and to crush all the obstacles which stand in its way.

At the present moment there seems to be one such obstacle. It comprises the land-owners who are unwilling to permit their lands to be used for its selected site. If persisted in, this is serious, and I fear, fatal. It is suggested that the Committee having the matter in charge hopes to remove it by procuring from the Legislature authority to condemn the lands of these owners.

This is no time to criticise the action of this Committee. Its members are doing a great public work, for which I fear they will receive no adequate reward; but I cannot avoid saying that I doubt the Constitutional power of the Legislature to condemn lands for such a purpose or for a public park to be used for such a purpose, and I fear that any application to the Legislature touching the site of this exhibition will involve litigation and delay which will prove fatal to its success.

I would suggest to the Committee that there is possibly a speedier and therefore a better way if every citizen will do his duty. They have determined upon the site for this exhibition. It is probably the best one; at all events, we must acquiesce in their determination. I have faith in a vigorous public opinion. When a strong Committee like the present one has selected the site for such an exhibition, I think the public would be interested to know who the individuals are that will refuse their concurrence upon just and equitable terms. It was not wise to propose to use any portion of the Central Park for this purpose. That proposal is now under-

stood to have been finally abandoned. Now let the Committee go on and lay out the exterior boundary of the lands necessary for the purpose. Let them secure the consent of every public-spirited land-owner who will agree to the use of his lands upon fair terms. Then let them make a second list, of those who will not consent to such terms. The public wants to see that second list. The name of every individual in it will become a subject of interest. We ought to know who the land-owners are who intend to live and own property in this City and yet who are selfish enough to refuse the use of their lands for such a purpose upon equitable terms. If the Committee will make that list, they need not concern themselves further. The press and the public may be safely left to deal with the individuals.

The claim has been made that some of these lands are held in trust, which will not permit their use for such a purpose. There is not much foundation for this claim. So long as only the use for three or four years is involved, the courts will find some way to justify the Trustees in co-operating in such a public purpose, should any such case arise.

It is not in human nature, with all its selfish instincts, to persist in opposition to such a great public enterprise, when fair compensation is proposed, for the use of the property involved. When it is found that no speculation in these lands will be tolerated, one after another of these owners will unite with public-spirited citizens, and in the end opposition will disappear.

There is then no cause for discouragement. The City of New York has determined to have this exposition. The Committee should go straight on with their work. Every citizen should do all in his power to support them. In such a public matter nothing is more powerful than a good example. These are becoming very numerous, and are announced almost daily in the public press. I do not believe there is any necessity for any application to the State Legislature. Two additional months of the successful labor which the Committee has so far performed will secure the site for the exposition, and leave us in a position to apply to Congress for the necessary National contribution at the opening of the December Session.

THE VALUE OF INSTRUCTION IN THE MECHANIC ARTS

AN ADDRESS

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