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No. 175,
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STUDY TO HAVE IDEAS.

A suggestive story is told of the late Joseph Harrison, of Philadelphia, inventor of the sectional boiler for which the Academy of Arts and Sciences awarded him the Rumford medal, and widely known as the partner of Winans in Russian railway contracts. He was climbing the Gemmi, in Switzerland, accompanied by a young man, and the conversation fell on the younger's chances of rising in the world should he embrace the profession of mechanical engineer. Mr. Harrison favored the idea, saying that this was the age of invention and improvement, that machinery was constantly being applied to new uses, and that he who would make it a study and master it in all its forms would never lack for remunerative employment. "But I have no skill in drawing," objected the young man. "Neither have I," said Mr. Harrison, "I never had time to learn. But I have always found that if I had an idea I could express it on a shingle with a piece of chalk, and let a draughtsman work it out handsomely and according to rule. And I've generally had ideas enough to keep three or four draughtsmen busy. You can always hire draughtsmen, but you can't hire ideas. Study to have ideas, my boy." It may be added that Mr. Harrison's success was due not to scholastic advantages, but to native capacity and personal effort.

It is a significant circumstance, and one that furnishes the basis for the severest criticism of the current methods of academic instruction, that men who, like Mr. Harrison, have attained signal eminence for originality of thought have rarely been men of much schooling.

The grand aim of the schools is to furnish the student with knowledge, a great deal of knowledge in a little time. To do this the method of cram, not that of original research and critical investigation, has to be adopted. The student's mental habit becomes that of a receiver, not that of a discoverer. He is loaded with knowledge, but in taking on the load he loses, through lack of use, if not through stern repression, the capacity to think or act except along the lines of conventionality and habit. The scholastic bias becomes stronger than the original bent, and the man loses in productive power in proportion as he gains in learning.

The fault does not lie wholly in the schools. The people demand for their children a teaching that can be measured quarterly—measured by quantity, not by quality; and on this score the child who takes most kindly to second-hand ideas is sure to win. Capacity for original ideas, for original and personal independent work, is at a discount. In other words, what the man most needs to have, the child or youth is least encouraged in cultivating.

While knowledge and skill are both highly desirable, they are still of second rank, and it is possible to acquire them at too great a cost. If a man has ideas—original, individual, creative ideas—he can usually hire skill and buy knowledge; he cannot hire ideas. We should be the last to decry skill or knowledge. They are essential elements of education. But they should be gained by processes which make them the tools, not the end of culture. The man should be the master, not the slave of his learning; and whether he is the one or the other depends very largely on the way his knowledge has been gained. And it is better to be the master of a little knowledge, with capacity to use it creatively, than to be the unproductive carrier of all the learning in all the libraries. Our young readers whose scholastic advantages, so-called, have been few, may well take the lesson to heart. Study to have ideas; life will give no end of opportunities for using them.

"THE PATENT RIGHT NUISANCE."

Under this heading the New York *Herald* ranges itself editorially with the opponents of inventors' rights, and discusses the alleged defects of the American patent system with the zeal of a recent convert and the ingenious perversion of the facts of the case characteristic of a misinstructed or unscrupulous advocate. The article reads very like a feeler thrown out by the clever attorneys who so persistently lobbied for certain anti-patent associations before the last Congress. It runs in this wise:

"Americans are notoriously the most inventive race in the world, and the number of patents issued yearly from Washington amounts to many thousands. An inventor like Edison, who has taken out more than 200 patents, is forced to spend no small portion of his time in ascertaining the scope of analogous inventions made by his numerous rivals, and it is alleged that the success of his recent experiments upon the electric light has been seriously impaired by finding that most of his proposed improvements were already protected by letters patent. Many of the more obvious inventions have been independently made by dozens of persons, only to find that they had been anticipated long before by some unknown individual who had never taken the efficient steps to make his invention known. The issuance of a patent thus becomes, in a vast majority of cases, only a means of repressing instead of stimulating independent inventions.

"That this evil has assumed vast proportions and calls urgently for remedy will not be denied by any one who is familiar with recent discussions in the scientific and technical periodicals. It is well known that nine tenths of the patents issued are of no practical utility, and only serve to confuse the inquirer and waste valuable time. Every invention of first-class importance has to be 'protected' by a score of minor patents which have nothing to do with the main discovery.

"It has even become a question of late, in Europe and America, whether the whole patent system ought not to be brushed away as a mere impediment to the development of manufacturing industry, leaving future inventors to rely for their compensation upon such advantages as their exceptional facilities for the production and introduction of their specialities as would naturally follow from their priority in the race and their more perfect possession of all the details. In nine cases out of ten the change would be to general advantage; still, some provision ought to be made for discoveries of far-reaching value.

"Three remedies would seem to be desirable. In the first instance the number of patents issued might be restricted at least ninety-five per cent by refusing all applications for such patents as are obviously of little or no value, as well as those which do not represent any new principle. Secondly, many of those inventions which are really of great practical importance should be at once purchased by the government for the general benefit of the public, every inventor being required to state his terms on making his application. With inventors of real merit the government can well afford to deal generously. Lastly, all patents should be considered to have lapsed when it can be shown that a reasonable period has elapsed without any effort on the part of the inventors to introduce them."

The assurance with which the name of Mr. Edison is made a peg on which to hang a sweeping indictment of the patent system is positively amazing. Just think of Mr. Edison as a victim to patent rights! and of the community at large as being deprived of the blessings of electric lighting because other men had been at work upon the problem before Mr. Edison took it up!

If Mr. Edison's word is good for anything, the public has the best of reasons for believing that, so far from having been hampered by the patent system, he has, as an inventor, been largely a product of it. Without the protection it has given him he would never have been an inventor; certainly he would never have devoted his life to that laborious and expensive pursuit. He has made invention his business because there is money in it to him, though infinitely greater profit to the world at large. His inventions are paying property, because, and only because, they are protected as property by all civilized nations.

The second assertion is equally at variance with truth. Grant, for argument's sake, the absurdly untruthful statement that nine tenths of the patents issued are of no practical utility. Does it follow that "they only serve to confuse the inquirer and waste valuable time?" The very opposite is true. A liberal patent system insures the publication of all efforts in new directions, and that is a matter of infinite importance. In his exploration of the unknown every inventor strikes many blind or doubtful paths. Shall he, or shall he not pursue them? Time is limited and he has far to go. The records of the Patent Office ought to furnish him the results of all previous explorations. Every patent issued is, in this way, a means of saving fruitless effort and waste of time. Even "worthless" patents thus become valuable, as warning signboards to the explorer. In the records of the Patent Office he reads: "A tried this way and found it unprofitable;" "B tried this—'no thoroughfare;'" "this road leads to the property of C;" "this to where D was lost in fruitless exploration;" and he guides his efforts accordingly.

The great object of the patent law is to secure the early publication of all these mental itineraries; and every measure calculated to prevent their publication is mischievous. Not unfrequently, also, the "worthless" patent fails for lack of some means for overcoming a special difficulty, which means are supplied by a discovery made after the life of the patent has expired. It stands, however, a permanent contribution to the history of thought, and the next man is saved the first inventor's fruitless toil; he freely bridges over the difficulty by the aid of the last discovery, and the world gets a valuable invention which it would have missed had the original "worthless" invention vanished unrecorded.

The *Herald's* next statement with regard to the recent tendency of American and European thought, with respect to the policy of issuing patents for inventions, is another flat misstatement of fact. The current of thought, not only among the common people, but among statesmen, is decidedly in the direction opposite to that asserted. Witness the steady progress of foreign patent systems toward the liberality which has made the American system so superior to all others.

The tendency of all civilized nations is steadily toward the fuller and freer recognition of the rights of intellectual property. Countries which, like Switzerland, originally denied the possibility of intellectual property, proclaimed "free trade in ideas," and refused to recognize the inventor's right to the products of his inventive toil, have learned that sound policy as well as abstract justice demands an advance to the position of higher civilization, and are copying the American patent laws so far as they are able to.

The limitations of space forbid an extended notice of the *Herald's* "remedies." They have been presented in every possible aspect, by the agents of anti-patent associations, in the committee room and in Congress, only to demonstrate more clearly their pretentiousness, the impossibility of putting them into practice, and the certain injustice to inventors, small manufacturers, and the public at large, that would flow from an attempt to carry them into execution.

ENGLISH VS. AMERICAN RAILS.

A short time since Mr. Vanderbilt purchased in England, for the New York Central Railroad, 10,000 tons of steel rails. These rails cost, on shipboard, £5 a ton. To this must be added a duty of $28 a ton, making the cost of the rails here

about $53 a ton. The price of American steel rails is from $45 to $47 a ton; in large lots perhaps as low as $43. It is clear, therefore, that Mr. Vanderbilt paid for the English rails something like 25 per cent more than American rails would have cost him.

Against this bargain certain American gentlemen, professing to speak in the interest of American rail makers, have protested with much vigor. One of these gentlemen, Mr. Alfred Earnshaw, of Philadelphia, after taking Mr. Vanderbilt severely to task for wasting his stockholders' money, closes his letter with these words:

"If a railroad president has any duties toward his stockholders, if a man occupying high public places has any duties toward the well-being of a great national industry, and if the railroads have any duties toward American steel rail makers in return for their services past and present, Mr. Vanderbilt's duty bids him plainly and openly give his reasons for this purchase."

When approached by a *Tribune* reporter, Mr. Vanderbilt pardonably declined to be brought to book after the fashion proposed. A "prominent official of the New York Central Railroad" proved less reticent, and explained the transaction in a way that, if true, reflects little credit upon the manufacturers of steel rails in this country. He said that the order was not given for the English rails until careful tests, chemical and other, had proved the English rails to be worth the price. The English manufacturers gave a guarantee of twelve years' wear, all rails not coming up to the standard to be replaced free of cost. Every American manufacturer applied to declined to furnish such a guarantee, five years being the longest time for which a guarantee was offered. "It is well known to railroad men," said the Central officer, "that the utmost limit of wear for American steel rails, as now manufactured, is five years, where they are subjected to the strain of heavy traffic such as continually passes over the New York Central road. Some of the English rails now laid on this road have been in constant use for many years without showing the least evidence of wear, while American steel, laid at the same time, has worn out, and must be replaced." That (these conditions being true) the English rails were the cheaper and the bargain a good one goes without telling.

There remains, however, a serious question for the American rail makers to answer, namely, Why are American rails inferior to the English? Mr. Earnshaw writes: "In justice to Mr. Vanderbilt, I will say that I believe it to be true that the American rails laid on his Western roads have worn out quicker than the foreign rails, but their life has not been sufficiently short to account for the difference in price."

On the contrary, the difference between a five years' guarantee and one for twelve years does amply justify the payment of a price larger by only 25 per cent. And the case against the American rail makers is even worse than appears on the face of this transaction. The American maker has in his favor a duty which practically doubles the cost of English rails in this country. Why is it, then, that the American manufacturer cannot make for $50 as good a rail as the English can for $25? The English price is no doubt exceptionally low just now; but the duty more than equalizes the conditions.

Since the foregoing was in type, the president of the American Iron and Steel Association, Mr. D. J. Morrell, has replied in the *Tribune* to the statements of the railway official quoted by the reporter of that paper. Mr. Morrell says that the alleged inferiority of American rails is not sustained by fact; and that the asserted brevity of the life of American steel rails "is a bold assertion of what is absolutely and entirely untrue." He says: "That some American steel rails may not under certain conditions last five years or even one year may be true, and it is equally true of foreign rails. The usual guarantee of American rails is five years' wear, with an agreement to replace all such as give out from fair usage within that time; and for this guarantee no extra charge is made. It is not fair for Mr. Vanderbilt to suppose that all American manufacturers of steel rails are so stupid as to make an inferior article, when, with the best of materials to start with, they can with the practice of intelligence and skill make a good rail with just as little cost as they can an inferior rail."

Further on Mr. Morrell says: "The hardness of temper of the rails is regulated by the amount of carbon the steel contains, and this is usually controlled by the roads that use them, some railroad managers requiring their rails much softer than others, preferring toughness and immunity against possible accidents from breaking, to the extreme hardness which would insure greater endurance. American rails have been used for more than ten years on many of our leading roads, and for the last six or eight years more than a million and a half tons have been put down, and I am ignorant of the first instance of any such complaint as would justify the assertion so boldly made by this 'prominent official,' indeed, I know exactly to the contrary."

In every large lot of rails there is a liability to be a few imperfect ones, from flaws in the ingot or from mechanical defects which cannot be detected by the closest and most careful inspection, but these imperfections usually disclose themselves during the first few months' service. This is equally true of English as well as American rails. The number of rails so failing within five years is so inconsiderable that the guarantee has never been considered any great hardship to manufacturers. If the utmost life of American rails is limited to five years, as asserted by a "prominent official," the New York Central might have its road kept constantly supplied with new rails under the usual American guarantee, without any expense to the company beyond the first outlay."

Touching the asserted twelve years' guarantee, Mr. Morrell says:

"I am not aware that Mr. Vanderbilt has ever asked for twelve years' guarantee from American makers, or even asked from them, certainly not from very many of them, at what price or on what terms they would supply his wants. His purchase of these foreign rails would seem to have some other motive than the one given. The 'economy' plan is too thin for credence."

While the indications are that the immediate interests of the Central Railroad may not have been the controlling element in determining this transaction, the makers of American steel rails are still left under the burden of a serious implication. It is not sufficient for them to deny the alleged inferiority of their rails. The charge must be disproved by specific and abundant evidence. The New York Central road is not the only road that has a large traffic, or that has tried American steel rails.

If other roads, under severe tests, have found American rails as durable as the English, their testimony would just now be of great value. If, as Mr. Earnshaw admits, they have not worn so well as English rails, it is the duty of the American makers to explain the cause, if they can, and remove it.

A REMARKABLE CONFLAGRATION—THE RIVER BETWEEN NEW YORK AND BROOKLYN SET ON FIRE.

One of the important receiving stations of the Standard Oil Company in this city is near the foot of Sixty-fifth street, on the bank of the Hudson River. Here the company have tanks for the storage of oil, which is brought directly into their premises in cars that come to the city over the New York Central and Hudson River Railway. From this station the crude oil is in part distributed in barrels to the shipping along the river, and to other points, but a large portion is transferred through a pipe line directly to the refinery at Hunter's Point, in Brooklyn. This pipe line extends under the streets of New York across the city to the East River, and thence under the bed of the river to the Brooklyn shore. The river at the point where the pipe line crosses is about three-quarters of a mile wide, a large and splendid stream, usually covered with sailing and steam vessels engaged in the ordinary services of the commerce of a great city like New York. The entire length of this oil pipe line is three miles, the oil being forced through it from the Hudson River to Brooklyn under a strong pressure, by means of a large Blake steam pump. On Sunday morning, April 20th, at a time when the river happened to be comparatively free from vessels, an appearance something like a water spout was observed on the river near the Brooklyn side. The water rose high up in the air and fell in graceful showers all around. In a very short time the surface of the channel was covered with oil, which naturally spreads rapidly on the surface of water and which was carried down stream also by the ebbing tide. This explained the unusual phenomenon. The oil pipe had burst at the bottom of the river and the oil was flowing in a big stream to the surface. Several little boys who were playing around the dock noticed the oil and promptly threw some lighted matches into the river. The oil ignited, and in a few seconds the whole river front was ablaze, and the dock also caught fire. The boys ran away rather more scared than happy. The fire engines were sent for as quickly as possible. Three responded. The fire on the dock, in rear of which are gas works, was quickly extinguished, and in about a quarter of an hour there was no appearance of fire on the river. But just as the firemen were about to leave, flames shot up here and there along the channel. Now and then, fanned by fitful gusts of wind, they lengthened enormously, and swept the fences and trees along the river front, scorching them here and there.

The oil continued to bubble up from the leak at the bottom of the sea, and the flames in that vicinity rose to a great height. It was not until all the oil in the pipe had risen to the surface and had mostly been consumed that the flames died out. This was fully four hours after the outbreak. The quantity of oil lost must have been very great. Beyond the scorching of a few vessels, the fences, trees, and the partial destruction of the dock, there was no other harm done.

Cleveland to be Lighted by Electricity.

We learn that the authorities of Cleveland, Ohio, have made a contract to light a large portion of the city with the Brush light. The lamp posts, which are very ornamental, and twenty feet high, have all been erected, and it is expected that the lamps will be placed in position in a short time. The results of this generous experiment in electric lighting will be noted with great interest by the public in general and electricians in particular.

PLASTER of Paris mixed with equal parts of powdered pumice stone makes a fine mould for casting fusible metals. The same mixture is useful for incasing articles to be soldered or brazed. Casts of plaster of Paris may be made to imitate fine bronzes by giving them two or three coats of shellac varnish, and when dry applying a coat of mastic varnish and dusting on fine bronze powder when the mastic varnish becomes sticky.

AMERICAN INDUSTRIES.—No. 11.

THE MANUFACTURE OF SPOOL THREAD.

In our last issue we gave an illustrated description of the manufacture of sewing machines; we now present to our readers a description of the manufacture of an article without which, in its perfect form, sewing machines would be useless. Thread, although one of the smaller articles of manufacture, is the foundation of an immense industry, and the processes and machinery by which it is produced have been developed and perfected until it appears that there is little room for further improvement.

The primitive method of spinning cotton thread was to attach a bunch of the carded cotton to a forked stick called a distaff, and, holding it under the left arm, the cotton was drawn out and twisted with the left fore finger and thumb; the size and quality of the thread being regulated solely by the delicacy of the touch as it passed through the fingers. As soon as sufficient length was twisted to reach to the ground, the thread was wound upon a stick called a spindle. In this manner the spinsters of Old England made their thread, and it was not until the time of Henry VIII. that the spinning wheel—which had long been in use in India—was introduced into England. After this came the spinning jenny, then the spinning mule, and then a host of machines for various branches of textile manufacture.

Without doubt the manufacture of thread, as conducted at the establishment of Messrs. Clark, may be taken as an example of the best practice. Entering their extensive manufactory, in Newark, N. J., one can but notice, first of all, the system, order, and cleanliness that everywhere prevail; the gleam of polished machinery, the hum and flutter of the thousands of spindles, spools, and reels, the ceaseless progression of the material from the raw to the finished state, convince us that the world must use an enormous quantity of thread, and, while wondering "where in the world" it all goes to, we are informed that this establishment furnishes only a fraction of the thread consumed in the United States alone.

A spool of cotton appears a simple thing, but when it is considered that the thread, which is so even and so strong, is composed of six cords; that the filaments which compose each cord are straightened and made parallel and twisted; that two such cords are united and twisted together, and that three of the double cords are twisted to form a complete thread, it becomes a matter of wonder that it can be profitably done for the price at which the thread is afforded to the consumer.

The machinery of the Clark Thread Works is driven by two double Corliss engines of about 500 horse power each, and several smaller engines, the power amounting to about 1,400 horse power. The engines, as well as all of the other machinery about the establishment, are in perfect order and of the finest quality.

The cotton, as it comes from the bales, passes through machines called pickers, which pick it up loosely, removing burrs, dust, and other impurities by means of a vacuum. From the pickers it passes to the lap machines, where it is similarly treated and well flattened and compactly rolled up into laps preparatory to passing through the carding machines. In the carding machines, which are shown in the upper right hand view in the engraving (front page), the fibers are further cleaned, combed, and broken, and delivered in a narrow unbroken ribbon, called the sliver, to tall cans, in which, by ingenious mechanism, it is coiled. The filled cans are conveyed to the ribbon lap machines, where a number of the ribbons are united in a single lap several times wider than the single ribbon. These laps or rolls are now conveyed to the French combers, which, with perhaps the exception of the spooling machines, are the most interesting of all the machines used in thread manufacture. They are intermittent in their action, and comb out all the short staple, leaving only the long fibers to be worked into the thread. The sliver, as it passes from the combers, looks delicate and gauzy, more like a spider's web than anything else. The machine handles it delicately, and brings it together in a narrow ribbon and coils it in the cans. This operation, which is represented in the upper left hand view in the front page engraving, is of the greatest importance, as it removes the short fibers and arranges the long ones to the best advantage.

The ribbon is next drawn and twisted in the drawing frames, and is afterward further twisted in two separate machines before spinning, and is wound upon large spools, which are carried to the spinning mules, shown in one of the lower views in the engraving. In each of these machines there are several hundred spindles, which revolve very slowly as they are carried forward by the carriage in winding the thread on the spindle, but revolve with great speed as the carriage draws back in the operation of spinning. The spinning mules are entirely automatic in their action; the attendant has only to repair the broken threads, of which there are not many. From the spinning mules the cops go to the cop winders, where two strands are wound together on a single spool. These two strands are twisted in the machine shown in the small circular figure. The bobbins revolve at a speed of about 5,000 revolutions per minute, and the thread is wound on the bobbins by a simple differential arrangement.

Three of these double strands are twisted together, making the well known six-cord spool cotton, for which this company are justly celebrated.

The spools from the twisting machines are conveyed to the reeling machines, shown in the large central figure,