THE RIGHT WHALE OF THE NORTH ATLANTIC.

As every one knows, right whales were once very common in the Gulf of Gascony, the dwellers along which, in France as well as in Spain, appear to have been the first Europeans to raise the fishery of these monsters of the deep to the rank of a great industry. Upon the coast of Cantabria are still to be seen the ruins of the towers where watchers were stationed to give notice of the approach of the numerous whales that visited these shores during winter, and the remains of the furnaces where the fat was melted. Official documents and royal edicts of the 12th and 13th centuries speak of the whale fishery as an already ancient industry. The majority of the cities of the Spanish coast—Fontarabie, Guetaria, Motrice, etc.—have figures of whales or of fishing implements on their coat of arms.

The Basques were soon no longer content to fish for whales on their coasts, where they were becoming scarcer and scarcer, but pursued them into the English Channel and North Sea, and as far as to Iceland. Later on, at the close of the 14th century, they did not hesitate to sail out upon the broad sea toward the quarter where Cabot, a hundred years afterward, discovered Newfoundland, and where they found the cetacean very abundant during the summer months. Their success made rivals for them, and in 1578 there were, on this part of the ocean, three hundred ships—French, Spanish, Portuguese, and English.

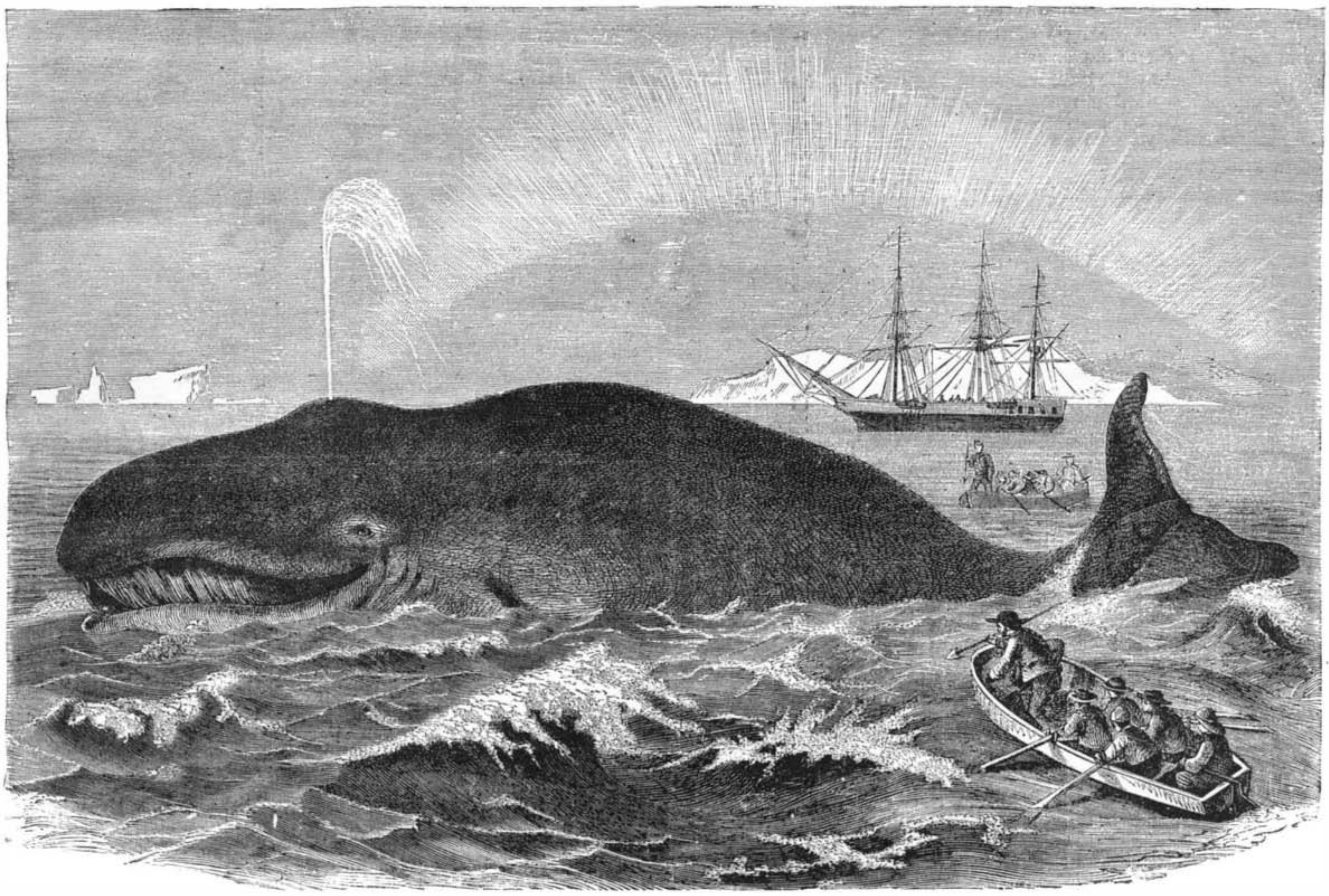
Fishing upon the high sea is scarcely applicable to any but the sperm and true whales—those whose back is even, finless, and without a hump—the "right whales" of fishermen (*Balæna*, L.; *Eubalæna*, Gray; *Leiobalæna*, Eschricht). The other cetaceans, the "finbacks" and "humpbacks" of fishermen, and *Balenoptera* and *Megaptera* of naturalists, almost always sink when killed, and are thus lost to the captors unless they are driven into a bay, where the carcass, upon making its appearance on the surface in a few days, can be towed to the shore and cut up. It is very probable, then, that the cetaceans that the old Basques fished for were sperm and right whales, and especially the latter, which were much commoner than the former in temperate or cold water.

As a consequence of the war against it, the whale became more and more rare. In the 17th century the seas in the vicinity of the pole, where navigators in search of a northeast passage to India had sighted a large number of the animals, which were remarkable for their gigantic size, became the scene of the fishery. A century later, the scene shifted to Baffin's Bay. Did these whales and those that were formerly fished for in the temperate part of the Atlantic belong to the same species? Upon the authority of Cuvier, when cetology was scarcely beginning to get out of its swaddling clothes, zoologists answered in the affirmative, and the reason that whales were no longer found in the temperate zone was because they had taken refuge amid the ice of the poles in order to hide themselves from pursuit! This is a gross error, which was perpetuated for a long time, which is still found repeated in many books, and which has been committed not only concerning the right whales of the North Atlantic, but also the various species of true whales distributed through the different oceans. The same causes have everywhere produced the same effects—the almost entire disappearance of the large, utilizable cetaceans. No longer than thirty years ago the whaling industry still occupied whole fleets; and the Americans, who had almost the entire monopoly of it, repeated with pride that their whaling vessels, placed in a line in sight of one another, would occupy more than half of a great circle of the globe. In 1856 they still had 655 ships on the sea, but to-day the industry is almost completely abandoned for lack of whales. Fishing is no longer done except by a few rare ships from the ports of Scotland, that go out to the Polar Sea for seals, and fish for whales incidentally. In the large seas of the temperate zones, the South Atlantic, the Pacific, and the Indian Ocean, where fifty years ago a load of oil was obtained in a very short time, the whale is now so rare that it may almost be said that there is none. It has been said that the whales of these seas fled toward the poles in order to escape man; but it is now well ascertained that the different species of right whales are quartered in spaces in which they accomplish, according to the season, periodical navigations that are necessitated by need of food and the parturition of the females, and which their organization does not permit them to leave. If no more of them are found, it is simply because they have been destroyed. Moreover, the frosts of the poles have proved no more of a barrier to whalemen than the heat of the tropics; every corner of the globe has been explored whither ships could venture, even at the risk of a thousand dangers. Just as soon as a new field was made known as productive, everybody flocked thither, and it was soon exhausted—a result that is explainable without recourse to the theory of flights or migrations *en masse*.

While regarding the polar whale (*Balæna mysticetus*, L.) as the same as was formerly fished for in the temperate North Atlantic, naturalists (Cuvier among them) catalogued, under the name of *B. glacialis*, another species which differed from *B. mysticetus* in its much smaller size, its slenderer body, its much smaller head, and its shorter mouth plates ("whale bone"), and which inhabited the shores of Iceland and Norway. The Icelanders called it *sletbak*, the Dutch, *nordkaper*, and the French, *sarde*—a name that the Basques gave to the whale of the Gulf of Gascony. It is astonishing that this name did not attract the attention of naturalists, and that they did not ask whether the *sletbak* of the Icelanders, the *nordkaper* of the Dutch, and the *sarde* of the Basques was the same animal. A discussion of the old fishery narratives and of documents derived from the Dutch and Norsemen answers yes. A Norse MS. of the 12th century, the *Royal Mirror*, teaches us that the Icelanders fished in the entire North Atlantic, and they perfectly distinguished *two* species of right whales—one at the north and the other at the south. They knew besides that these animals never frequented the same waters, and that the northerly limit of the one was the southerly limit of the other.

If representatives of the southern species remained, they must have been very rare, for one could traverse and retraverse the North Atlantic without meeting a single one of them. The case is cited of a right whale stranded upon Re Island, in February, 1680, and in 1783 a whaleman harpooned one between this island and Newfoundland. Cod fishermen have spoken much of whales in the vicinity of this island, but science has not pronounced upon it. The whale of the Basques was regarded as extinct, when, on the 14th of January, 1854, a specimen accompanied by a calf showed itself opposite Saint Sebastian. The mother succeeded in escaping, but the calf was captured. Its external form and a study of its skeleton convinced Eschricht that it belonged to a peculiar species differing completely from *B. mysticetus*—hence the appellation *B. biscayensis*, introduced by him into the nomenclature.

Five Balenidæ, either stranded or captured upon the Atlantic coast of the United States between 1862 and 1883, and considered at first by Prof. Cope as belonging to a new species (*B. cisarctica*), have been found to differ in nowise from the Saint Sebastian specimen.



THE RIGHT WHALE OF THE NORTH ATLANTIC.

The cetaceans that were called φαλαιναι by the Greeks and *balænæ* by the Romans were doubtless large balænoptera that entered the Mediterranean, and perhaps also sperm whales (which are sometimes met therein), and not right whales, since these do not seem to have ever frequented this sea, at least regularly. At all events, their presence there had never been authentically announced since historic times until February 9, 1877, when, to the great joy of cetologists, a female was captured in the Bay of Taranto. The length of this was about forty feet. Its relatively slender form, the small size of its head (one-fifth the length of its body), and the shortness of its mouth plates (numbering 240 on each side), the largest of which was only 30 inches, its falcate pectorals, and its black color separated it widely from *B. mysticetus*. Its stomach was entirely empty, and it appeared to have suffered from a long fast. In consequence of this peculiarity, and from its resemblance to the whales of the southern hemisphere, Prof. Capellini, of Bologna, believed that it came from this latter region. To him it was, perhaps, a representative of the Indian Ocean species, one nearly unknown to naturalists, and one that no European museum had the remains of.

Among other objections to this manner of viewing it, there is one that is very important, viz., it has been well proved that the right whale never passes from one coast of the equator to the other, this being for it like a circle of insuperable flames, and that, except in very rare cases, it even keeps outside of the tropics. It was more natural to see in the Taranto whale a North Atlantic species that had strayed into the Mediterranean, and this was proved by a comparison with the Saint

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Sebastian calf and other skeletons, and by a very complete study by Prof. F. Gasco. According to the latter, the animal could not have been more than three or four years old, judging by its size, and in admitting that the female of *B. biscayensis* (as shown by several examples) was fifty feet in length. A female of this size, taken by the harpoon off the coast of New Jersey, was towed to New York in the spring of 1882. This also had a wholly black body. From the figure of it given in the *Bulletin* of the American Museum of Natural History (May 1, 1883), it appears to have been more massive than the Taranto specimen. This relative heaviness is perhaps attributable to a difference of age between the two individuals. In short, compared with known examples, it does not exceed the limits of individual variation. Thus the whale of the Basques (*sarde, nordkaper, sletbak, balæna biscayensis*, Esch., *B. cisarctica*, Cope) still exists, although represented, it is true, by a small number of individuals. It inhabits the North Atlantic, and in winter frequents the coasts of Europe, and in summer those of North America, where probably the females are delivered. Iceland is its northerly limit. It appears nearly certain that its migrations take place entirely in the course of the Gulf Stream.

For some time past the number of individuals has sufficiently increased on the coasts of South Carolina and Georgia to make it an object to fit out vessels for capturing them, and the operations of these have given results that are satisfactory to the eyes of the promoters, but deplorable to those of naturalists. As its resurrection has been nipped in the bud, will not the species for ever disappear?—*H. Jouan, in Science et Nature.*

Engineering as a Profession.*

A recent writer on political economy says: "The tournament of the world has changed its fields and its weapons. Men no longer strive with lance for a lady's favors. They struggle with matter to change its forms and add to its value. He who can render industry more varied or more efficient, who can turn any element or gift of nature to novel use, is the winner of the prize."

The same writer says further: "Society will not dispense with professional men, although they do not stand so far above the level as in generations ago. We will call upon lawyers when we get into strife over property, and they are necessary to the social structure which protects the person. While sickness comes, doctors will maintain their calling. So long as there is a soul that longs for immortality, clergymen will be welcome in home and pulpit. But with expanding industries, with developing science, new professions have gained favor. Commerce has its spheres in which high training and strong intellects are needed and are well rewarded. So has the varied mechanism of this age. In the professions hundreds are starving in this country in the foolish pride of a decayed caste. In the walks of production, wealth invites every man who will bring brains and industry, which will win skill."

It is of one of these new professions, engineering, that I would speak, and I claim for it a rank as a learned profession equal to that of law or medicine, and second only to that of divinity.

Such a claim, for engineering to rank as a learned profession, worthy of all the honors that have been paid to the older professions, may seem to you, who are students or practitioners in that profession, as an unnecessary statement of a truism—one which needs no proof; you already accept it as almost an axiom. But it is not thus accepted by the world at large. In a recent conversation with a lawyer on this subject, he held that it was impossible that engineering could be of equal rank with the three learned professions of the olden time, since all its work tended only to the material advancement of the race; it benefited civilization only by the increase of wealth which it brought; it was of the earth earthy; in fact, a servant of Mammon; while the other professions were on a higher plane, preserving the life and the morals, and dealing with the intellect and with the immortal part of man. So Charles Dudley Warner, in the *North American Review* for September, 1884, writes of the "Demand of the Industrial Spirit" (of which spirit we must admit that the engineering profession is the handmaiden) as denying the higher wants of the soul, as "demanding a radical revision of the college curriculum, and that the ancient stamp of scholarship shall be put upon industrial and commercial pursuits." He says: "The last demand of the industrial spirit is that all education shall be lowered to its material aims; for lowered it will be, if all distinction is removed in academic honor between an education for the sake of the mind itself and an education dependent on and limited to material and practical aims. The danger in this is no less to science than to literature and philosophy. It is the greatest of all to the tone of modern life."

Such criticisms as these of the modern tendency of educational methods to fit men for the practical duties of life make it necessary for us to be able to give a reason for our belief that such a tendency is not a degrading one, and that one of the results of such a tendency, that of placing engineering on the high plane of a learned profession, is not a danger to the tone of modern life, but one of its best safeguards, and is a real and important step in the advancement of civilization.

Let us first consider the requirements of the three professions which have hitherto appropriated the distinction "learned," and compare them with the requirements of the profession of engineering. But first we notice that the requirements of the three older professions are not now the same as they formerly were, but are becoming broader and more severe as the general public becomes better educated. In olden times, it might be sufficient for a lawyer to own a few books, to have a knowledge of the forms of law, and to have the ability to browbeat a witness and befog the judge; the doctor needed to be expert with the lance and with the leech, to have a wise expression of countenance like that of the owl, and be faithful in adherence to tradition regardless of the consequence; the minister should be a man of lordly mien, to be able to exercise proper authority and command the respect of his parishioners, and to have the grace of charity and general kindliness of manner, so as to make him always a welcome guest in their homes.

In modern times, however, the requirements have greatly expanded. It is necessary for a lawyer, in counsel, to have such intelligence and such honesty as will enable him to advise a client when to avoid as well as when to seek litigation; in advocacy, to have all the powers given by a thorough knowledge of logic and rhetoric, the quickness of perception, the eloquence, and the profound knowledge of the law, which are needed in combat against similar powers arrayed on the other side. In medicine, a doctor must know when to withhold as well as when to give medicine, how to save a leg as well as how to take one off; and he must keep familiar with all the most recent discoveries of medical science, and know how to make proper application of them. In divinity the minister must keep abreast of his flock in intelligence; must be well versed in history, literature, and science, as well as theology, to enable him to meet every new argument against his own beliefs which may be drawn from any branch of human knowledge. These three professions now all ask for the most liberal general culture, including not only a classical education, but a knowledge of the universe of learning, of all that is known or to be known of nature and humanity.

Let us compare these requirements with those of an engineer who should rank as a member of a learned profession. He should be a man of broad, general culture. No branch of education should be looked on by him with contempt, and his culture should be a broader one than that given by the old college curriculum. The "demand of the industrial spirit" is a noble one. It is for a higher and broader education than that of Oxford and Cambridge. All the culture that the Greek and Latin tongues may give, all that history, literature, music, and the fine arts may give, must not be slighted. Do the classics give a man stronger reasoning powers? Does literature give him the graces of speech and the power of the pen to mould human thought? Do the fine arts give him the sense of the beautiful? All these are of benefit to the engineer; but to these he must add, as more important to his professional success, the knowledge of human nature and of finance, gained only in the school of business experience; and of the higher mathematics, which he must use as easily as a mechanic does his two-foot rule; of the sciences which reveal to us the secrets of nature—geology, mineralogy, physics, chemistry, and their allies; and to all these he must add a sound body with a sound mind, a familiarity with the powers and the limitations of the mechanical trades, and a certain amount of personal manual dexterity.

So vast, indeed, is the field of knowledge which the profession of engineering requires as its foundation, that no one man can be expected to encompass the whole of it. As the jack-of-all-trades is generally master of none, so the engineer who attempts to become educated in all branches of even the groundwork of an engineering education, not to speak of the branches of the profession itself, is apt to prove a failure. Hence the necessity not only of specializing the profession of engineering into the branches of military, naval, civil, mechanical, mining, electrical, sanitary, and the like, but also of making a discrimination as to the branches of general education which should be acquired as preliminary to an entrance into the general study of engineering, and of its special branches. Hence the specializing of schools of engineering, Rensselaer devoting itself chiefly to civil engineering, Columbia to mining, Stevens to mechanical engineering.

So much for the requirements of the engineering profession so far as education is concerned. Let us now consider its requirements in actual work.

The work of the engineer has been defined as the overcoming of the resistances of nature, and the best engineer is he who effectually overcomes these resistances with the least expenditure of time, labor, and money. The successful engineer must love his work for its own sake, and not for its emoluments. He must have the same professional pride that a good lawyer or doctor has, and be ready to sacrifice his money, fame, or even life itself, if duty should demand it. The responsibility thrown upon an engineer is sometimes one whose extent cannot be measured by a money standard. His mistakes may be more serious than those which hurt only the pockets of the lawyer's client, or those which the doctor buries six feet underground. Think of the mistake of the Ashtabula Bridge, the engineer of which committed suicide; of the Tay Bridge, the disaster to which is said to have broken the heart of its builder. And as to financial responsibility, how many millions of dollars have been lost by engineering mistakes? See the abandoned mines and mills in our gold and silver districts, the silent blast furnaces and rolling mills built in the wrong locations, the waste of money and of life in the Hudson River Tunnel and in the Panama Canal.

No higher trusts are assumed by any other profession than by that of engineering. It behooves that profession, therefore, as much as any other, to be sensitive of its honor. Shall a judge be corrupt, or a lawyer defraud his client? No more should an engineer either give or take a bribe, or do aught to bring dishonor on himself, or to demoralize his associates. In manners he should be beyond reproach, but in integrity beyond suspicion.

In its rewards the profession of an engineer is not behind any other. If statistics could be brought to bear, I have no doubt that professional engineers could be found, on an average, to be reaping greater financial rewards than the average of doctors, lawyers, and ministers of the same number of years in practice. Mr. Roberts, in his "Government Revenue," estimates that of physicians only one-third earn over $2,000 per year, one-fifth earn between $1,000 and $1,500, the next one-fifth will strive for $1,000, and one-fourth will get only $600, $500, or less. Of lawyers he says the annual earnings of less than one-fourth are $2,000 per year, one-tenth in addition receive $1,000 a year. "No calculation can bring the number getting $1,000 a year from their profession to one-half of those on the rolls as in active practice. One-fourth do not earn $500 annually from legal business." I have no doubt that the engineering profession would show a much better record than this if statistics could be obtained.

In the reward of public fame and honor, no profession stands higher than that of the engineer. If a list of the benefactors of mankind since the time of Archimedes should be made, the engineers of the world would be conspicuous in it, both in the number of their names and in the grandeur of their achievements.

There is one grand distinction between the professions of law, medicine, and divinity and that of engineering. The former are the professions of conservatism, the latter is the one of progress. The object of the profession of medicine is the conservation of life; that of law, the conservation of morals and the rights of property; that of divinity, the conservation of belief. Engineering, however, is essentially progress. Its history is one of continual advancement. It is like science itself, so far in fact that many of the advancements in civilization greatly credited to science, pure and simple, are really the achievements of engineering, an applied science, of which pure science is but the handmaid. In this connection I may quote from Prof. Thurston's paper on the "Mission of Science," and you will note that the word "engineering" might be used wherever he uses the word "science":

"A century ago, with the birth of the steam engine, later with the introduction of the product of the printing press into the daily life of the world, with the operation of the electric telegraph and the introduction of the railroad, began the real progress of science, and we are now seeing but the beginning of her awe-inspiring career. She has taught us to drive 10,000 tons across the seas by the might of over 12,000 horse power engines. She has taught us to send printed messages across the continent; she has shown us how to drive railroad trains faster than birds can fly, yet the mission of science has made but the veriest beginning. It still remains to her to perfect and systematize a thousand new industries, to invent as yet unimagined new arts, to bring the laborer worthy of his hire all that he needs and all that he can desire for his own comfort and for the care and comfort of his family, to adjust the power of production to that of consumption, and both to the working capacity of the world, so that the now seeming natural conflict between labor and capital shall no longer have even an appearance of existence."

Probably similar thoughts were in my own mind three years ago when, writing from the Electrical Exhibition in London, I mentioned the possibilities of future achievements of one branch of engineering, the electrical. I said: "These currents of electricity shall furnish power to drive our railway cars, our road vehicles, and our steamboats; shall furnish energy to run our sewing machines, to raise our water, to light and warm our houses, and cook our food. They shall sepa-

* Extract from an address to the Alumni Association of the Stevens Institute of Technology, by Wm. Kent, M.E., President of the association, delivered June 18, 1885.—*Van Nostrand's Engineering Magazine* for August.

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rate the ore from the dross, shall reduce and fuse the ore into metal, and shall gild and refine not only our metals, but our whole civilization. And when this is done—when man has subdued unto himself all the forces of nature and forced them to do his work, will he work any fewer hours or less hard? Will he take any more rest, or any more pleasure, or will he be the same overworked, nervous, ambitious, and dyspeptic creature that he is now? Will electricity solve the labor problem? Ah! these are questions apparently beyond the reach of our present philosophy, but they are questions which the future is bringing to us with terrible rapidity. It is wise to look them in the face."

I have thus given you briefly some of my views on the requirements of the engineering profession, of the work it is called upon to do, and of some of its future possibilities. I hope you see, as I do, that the profession is not altogether of the earth earthy, that it is not altogether a profession whose end is simply the increase of wealth of a favored few, but that it is a profession charged with as weighty responsibilities and duties to the human race as any other; that it is the profession to which the world must look for nearly all future advances in civilization, whether these come through the enginery of war, civilizing barbarians by the means of modern artillery, through sanitary engineering, at the same time preserving the health and benefiting the morals of mankind, or through inventions which shall so increase the wealth of the human race at large that the primal curse of labor may be to a great extent removed, and the race have more time than it now has for the cultivation of its intellectual, moral, and spiritual nature.

The Iron Business.

The present condition of the iron industries, though by no means all that could be desired, may fairly be looked upon as satisfactory. If circumstantial evidence goes for anything, the recent amicable settlement of labor difficulties in the Pittsburg district and the West indicates a better feeling among manufacturers, if not an actual revival of a long stagnant industry. Owing to the almost deplorable condition of the market during the past year, the manufacturers found themselves paying rates for labor unwarranted by the scale of profits, and they determined, when the scale of wages should be adjusted on the 1st of June for the present year, to insist upon a reduction. The result was a general strike of the men and the shutting down of the mills. Later on the demands of the men for last year's scale were acceded to with some trifling changes, and the whole district blossomed once more into life.

Considering the reiterated complaints of the manufacturers, based upon facts and figures, that there was no profit in iron making at the old rates, there was something strange in their sudden acquiescence, and for a time it looked as though only those mills having large contracts unfilled would fire up. But it very soon became apparent that this was not the case.

The whole iron making community of Pittsburg and the West seemed, of a sudden, to see signs ahead that warranted them in paying rates which, but a short time before, they had refused to consider seriously. It is possible that besides the chances of a good market in the autumn, they saw a means of reducing the cost of manufacture by the use of natural gas, a fuel which is now used throughout the Pittsburg district in lieu of coal.

However that may be, the iron mills are now actively engaged in turning out iron to meet the expected demand.

The present condition of the market, though this, of course, is not to be taken as an index to what is to be three months hence, may be looked upon as unusual, if not extraordinary. The quality of iron reaching the market is not up to the mark, and far in excess of the demand, and yet there is a ready sale at good figures for the best grades, and not enough of the latter to go round.

The bugaboo concerning cheap Southern iron, which for a time created not a little consternation among Western and Eastern ironmakers, has at last disappeared, and those enthusiastic persons who have been writing to the press about the cheapness of iron manufactured in the South, and naming ridiculously low figures at which it could, with a profit, be placed on Northern markets, may now turn their attention to other and more promising themes.

The American Institute of Mining Engineers performed a valuable service when, through their president, Mr. J. C. Bayles, they made a searching investigation into the facts concerning iron manufacture in the South.

Before the meeting of the society at Chattanooga Mr. Bayles said: "When the red fossil ores of Alabama were first in demand, they were taken off the Red Mountain outcrop, and of course gave strength and encouraged the statement that vast quantities of ore were in sight and required no mining. They panned out 50 per cent virgin iron, though giving no trouble whatever in mining. In estimating the cost of producing iron from these ores, it was assumed that two tons of ore to the ton of iron would be needed, and that the ore at furnace would not cost more than sixty cents per ton. But of this surface ore the quantity is comparatively limited. To secure a supply, mining below the surface is necessary, and as we go deeper we find that the ore becomes harder and more difficult to mine, as well as leaner in iron, averaging only about forty per cent. When operations began, a good miner could easily mine eight to ten tons of the soft surface ore a day without explosives, but it requires a good hand to mine four tons of the hard ore in a day, even with a liberal use of forty per cent dynamite. Consequently, instead of making a ton of iron with two tons of ore, costing one dollar and twenty cents, it requires two and two-fifths tons of ore, costing about two dollars and forty cents per ton of iron.

"For furnaces so situated that a railroad haul is necessary, twenty-five cents per ton must be added, bringing the cost of ore up to about three dollars per ton of iron, or one dollar and eighty cents more than the original estimates. There is plenty of ore in Red Mountain, but it is not all available. Its quality varies as much as its quantity. Much of it is so silicious as to have no present value. According to the best information I can gain, the red fossil ores used at all the coke furnaces in Alabama carry an average of seventeen per cent silica, and the percentage increases as greater depths are reached. The surface ore contains but little lime, while the hard ore contains from fifteen to thirty per cent. In this variation is found the explanation of much of the difficulty experienced by furnace managers in Alabama. The greatest care is necessary to keep the surface ore and the hard ore separate, and the burden must be changed frequently. Hence lime sets and scaffolds are very common, and the time lost by reason of these almost unavoidable accidents would turn a Northern furnace manager's hair gray in a very brief period.

"Taking into consideration the quality of the red fossil ores of Alabama, the most favorable of this district, the quality of coal for coking, the inconveniently placed location of limestone, and the troublesome labor questions, I have the best and most intelligent as well as the most conservative local authority for calculating the cost of iron making at the point where the natural advantages seem to be greatest, as follows, per ton of pig iron: 2 3-5 tons of ore at $1.25, $3.25; 2 tons of coke at $2.50, $5.00; 1 ton of limestone, 85 cents; salaries and labor, $2.50; interest and expenses, 50 cents; repairs and replacement, 50 cents. To this is added the average cost of getting to market, which is estimated at $4, making the total cost about $16. Mr. Bayles could see nothing in these figures to discourage iron makers or alarm producers of other sections. The hope of the South is a large local consumption of iron. Most of its pig iron product now pays freight to Northern rolling mills and foundries, and such part of it as is needed for Southern use pays a second transportation charge when returned in manufactured forms. In this respect Southern industrial development has not been uniform. Its permanent prosperity will be found in rolling mills, machine shops, foundries, and manufacturing industries to consume pig iron and convert it into a form which will bear transportation better than the raw material."

The increased and increasing demand for steel is resulting in changing many iron mills into steel works, and the new process for steel making (the Clapp-Griffiths), unless its virtues are greatly exaggerated, makes the presence of phosphorus in American ores no hinderance in steel manufacture. This process is pneumatic, and in more than one particular resembles the Bessemer, but it differs from that in the construction and management of the converter and the position of the tuyeres; the latter being in the sides instead of the bottom of the vessel.

With the prospects of a good trade in the immediate future, mills and shops engaged in all kinds of manufacture are showing a disposition to renew or improve their plants, and the result is already seen in the increased activity in the iron and steel works, the only class of iron manufacture remaining abnormally dull being that engaged in supplying the railway trades.

The New Exposition at New Orleans.

The buildings and plant of the World's Cotton Centennial Exposition at New Orleans have been bought by a stock company for $175,000, the amount of indebtedness attached to the late enterprise. The new Board of Managers are to reopen in the fall again, under the title of the North, Central, and South American Exposition, the display to be opened to the public November 10, and close not later than March 31. The plans and regulations are similar to those of the last exposition, and the display is intended to cover the same class of exhibits. The entry book for exhibitors is to be opened August 1 and closed November 5, so there need be no delay in opening at the appointed time with everything in order from the start. The company to manage the new exposition is organized under the laws of Louisiana, with a capital stock of $500,000, and it is said will not ask or expect aid from the government.

Sunstroke, or Thermic Fever.

No error can be fraught with more dangerous consequences than that of failing to discriminate between heat exhaustion and true sunstroke. The former is comparatively a mild affection, which does not differ in symptoms from any other form of acute exhaustion. It is characterized by dilated pupils, a cold, pale, and perspiring skin, a quick but feeble pulse, with great general prostration, and a tendency to syncope. Recovery ensues within twenty-four hours under rest and the administration of stimulants.

True sunstroke, or *coup-de-soleil*, is a far more terrible affection. It is characterized by contracted pupils, a hot, dry, and flushed skin, rapid, and forcible pulse, throbbing carotids, labored or stertorous breathing, with profound coma, or delirium and convulsions ending in coma. In the fulminant cases that have been observed, the unfortunate persons have dropped dead as if struck a mortal blow by an unseen hand. Contrary to the popular opinion, it is not necessary that the patient should have been exposed to the direct rays of the sun. For as was noticed by many distinguished observers, and practically demonstrated by Dr. H. C. Wood, Jr.,* in his experiments on animals, excessive heat and heat alone is the essential factor in this disease. Many of the worst cases have occurred at night, in houses, in tents, and in narrow defiles, where the sun never entered, but where the atmosphere was hot and stifling. It is, therefore, a true fever, and, as suggested by Dr. Wood, should be designated thermic fever, as expressive of its exciting cause.

The treatment, which must be instituted promptly, can be summed up in three words: reduce the temperature. It is the extraordinary high temperature which is burning up the patient, and which, unless speedily reduced, will cause death by paralysis of the heart. He should therefore be at once removed to a shady place in the fresh air, his head slightly elevated, and his whole body, especially his head and chest, kept deluged with ice water. An ice cap, in addition, should be applied to the back of his head, until his temperature and pulse have fallen. Aconite internally will also probably be found beneficial in controlling the circulation. Morphia, hypodermatically, has been found to be of great value in cases characterized by restlessness and convulsions. If the attack has come on shortly after a meal there can be no doubt of the propriety of at once unloading the stomach by an emetic. If the patient is insensible, apomorphia, gr. one-tenth, may be given hypodermatically. The Australian physicians produce emesis in these cases by the rectal injection of twenty grains of ipecac. They have always noticed an abatement of the symptoms as soon as vomiting began.—*Medical Bulletin.*

An Early Safety Lamp.

The first attempt toward a safe light of which there is any record was one made in the year 1760, by Mr. Carlisle Spedding, of Whitehaven, Eng. He invented the machine known as the steel mill, which consisted of a spur and pinion wheel, geared about 6 to 1, fixed in a wooden frame on the same shaft as the pinion, being a steel disk about 6 inches in diameter. The disk was made to revolve rapidly, while the player, as the person who worked it was called, held a piece of chalk flint against its sharp edge. This produced a rapid succession of sparks, giving a light—though but a feeble one—for the miner to work by.

When firedamp was known to exist, the players were instructed to be careful not to work it too rapidly, so that the coruscations might be of the lowest temperature possible. At the time of its introduction, the machine was considered perfectly safe, but such was not the case, for in spite of every precaution, explosions of firedamp were known to be the result of its use. It was rarely used in working places, but frequently in exploring and traveling in old workings. The color of sparks emitted by the mill afforded some test as to the quantity of firedamp present. The sparks were of a dull red where but a small percentage of firedamp was present, but they were of a very bright red color where the gas was of a strong explosive mixture.

As each machine required a separate person to work it, the expense of maintaining a large number of steel mills was necessarily very heavy, and their cost would be sure to militate against their general adoption. It is said that at one time the workings in Hebburn Colliery were entirely lighted by the steel mills, of which they had over fifty at work.

The Gulf Stream.

From his observations during the past three months, Captain Pillsbury finds that the strength of current of the Gulf Stream is invariably on the Florida instead of the Bahama side of the stream. He has found the temperature of the stream to range from 42 degrees to 81 degrees. The greatest velocity of the stream at the surface is about 4½ knots, but the fluctuations are frequent and great.

* Thermic Fever, or Sunstroke. By H. C. Wood, Jr., M.D. J. B. Lippincott & Co., Philadelphia. Boylston Prize Essay.

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