THE GREAT WHEEL AT CHICAGO.

The wonderful "merry-go-round" designed by Engineer George W. G. Ferris, of Pittsburg, Pa., is now completed and forms a most remarkable and attractive object. This curious piece of mechanism carries thirty-six pendulum cars, each seating forty passengers; thus one revolution of the wheel carries 1,440 people to a height of 250 feet in the air, giving to each passenger a magnificent view and a sensation of elevation akin to that of a balloon ascent. The practical working of the great machine is attended with perfect success, and its construction and operation reflect the highest credit on the author.

The description of the construction of the great wheel given in the Chicago *Tribune* will be of interest, and we make the following abstract:

The wheel is composed of two wheels of the same size, connected and held together with rods and struts, which, however, do not approach closer than twenty feet to the periphery. Each wheel has for its outline a curved, hollow, square iron beam, 25½ × 19 inches. At a distance of 40 feet within this circle is another circle of a lighter beam. These beams are called crowns, and are connected and held together by an elaborate trusswork. Within this smaller circle there are no beams, and at a distance there appears to be nothing. But at the center of the great wheel is an immense iron axle, 32 inches thick and 45 feet in length. Each of the twin wheels, where the axle passes through it, is provided with a large iron hub, 16 feet in diameter. Between these hubs and the inner "crowns" there are no connections except spoke rods, 2½ inches in diameter, arranged in pairs, 13 feet apart at the crown connection. At a distance they look like mere spider webs, and the wheel seems to be dangerously devoid of substantial support.

The explanation of this is that the Ferris wheel—at least inside the smaller crowns—is constituted on the principle of a bicycle wheel. The lower half is suspended from the axle by the spoke rods running downward, and the upper half of the wheel is supported by the lower half. All the spoke rods running from the axle north, when it is in any given position, might be removed, and the wheel would be as solid as it would be with them. The only difference is that the Ferris wheel hangs by its axle, while a bicycle wheel rests on the ground, and the weight is applied downward on the axle.

The thirty-six carriages of the great wheel are hung on its periphery at equal intervals. Each car is twenty-seven feet long, thirteen feet wide, and nine feet high. It has a heavy frame of iron, but is covered externally with wood. It has a door and five broad plate glass windows on each side. It contains forty revolving chairs, made of wire and screwed to the floor. It weighs thirteen tons, and with its forty passengers will weigh three tons more. It is suspended from the periphery of the wheel by an iron axle six and one-half inches in diameter, which runs through the roof. It is provided with a conductor to open the doors, preserve order, and give information. To avoid accidents from panics and to prevent insane people from jumping out, the windows will be covered with an iron grating.

It is being considered whether each car shall not have a telephone connection with the office on the ground. It is thought that this would be an attraction, both as a sort of amusement for people who wished to converse with their friends below or in another car and as a sort of reassurance to timid people. The thought of being detained up in the clouds, as it were, by accident, and not being able to learn what it is or when it will be remedied, might frighten some timid people out of making the trip. It is not very difficult, however, to climb by the wheel itself to any car, and there will always be men on the ground who can do this.

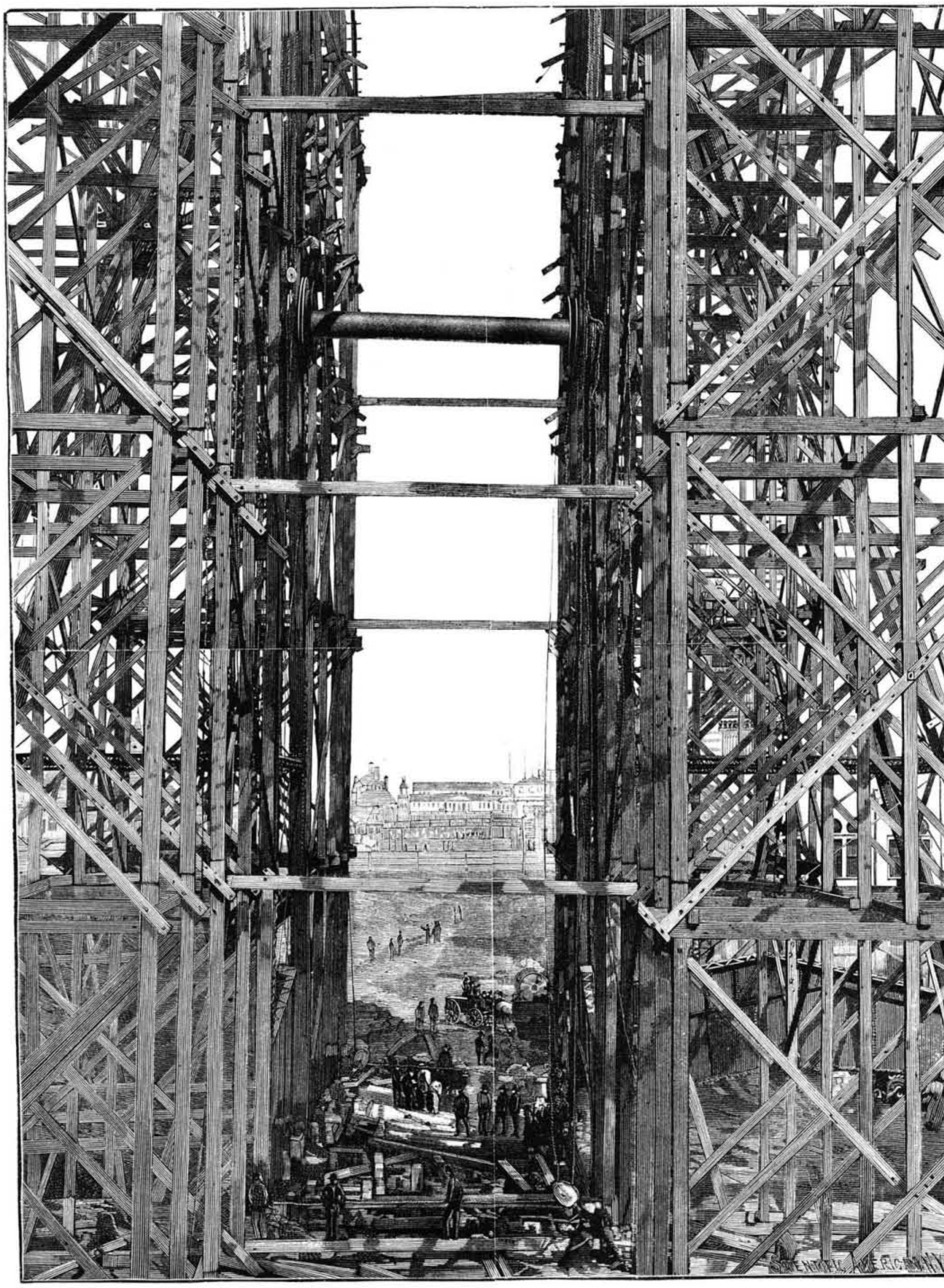
The wheel, with its cars and passengers, weighs about 1,200 tons, and therefore needs something substantial to hold it up. Its axis is supported, therefore, on two skeleton iron towers, pyramidal in form, one at each end of it. They are 40×50 feet at the bottom and 6 feet square at top, and about 140 feet high, the side next to the wheel being perpendicular, and the other sides slanting. Each tower has four great feet, and each foot rests on an underground concrete foundation 20×20×20 feet. Cross bars of steel are laid at the bottom of the concrete, and the feet of the tower are connected with and bolted to them with iron rods.

One would naturally suppose that there would be great danger of making such a huge wheel as this lopsided or untrue, so that it would not revolve uniformly. Even if the wheel itself were perfectly true, it would seem that the unequal distribution of passengers might make it eccentric in its speed. But according to L. V. Rice, the superintendent of construction, there is absolutely no danger of this kind. Not only did the wheel alone turn uniformly, but when the cars were hung, one after another, no inequality was observed. As to passengers, Mr. Rice says that the 1,400 passengers will have no more effect on the movements of the speed than if they were so many flies.

The wheel, however, is never left to itself, but is always directly and constantly controlled by a steam engine. The wheel points east and west, and the one thousand horse power reversible engine which runs it is located under the east half of it and sunk four feet in the ground. The machinery is very similar to that used in the power houses of the cable car companies, and runs with the same hoarse roar that they do. It operates a north-and-south iron shaft 12 inches in diameter, with great cog wheels at each end, by means of which the power is applied at each side of the wheel.

The periphery of both of the great outer crowns of the great wheel is cogged, the cogs being about six inches deep and about eighteen inches apart; and the power of the engine is applied at the bottom of the wheel. Underneath the wheel, in line with the crown on each side, are two sprocket wheels nine feet in diameter, with their centers sixteen feet apart. They are connected by an immense endless driving chain, which plays on their own cogs and on the cogs of the great wheel as well. These sprocket wheels are operated by the engine at the will of the engineer, who can turn the wheel either way, and fast or slowly, as he may wish. The wheel is 250 feet in diameter, 825 feet in circumference, and 30 feet wide, and is elevated 15 feet above the ground.

The great wheel is also provided with brakes. Near the north and south ends of the main shaft are two ten-feet wheels, with smooth faces, and girdled with steel bands. These bands terminate a little to one side in a large Westinghouse air brake. If therefore anything should break, and the engine fail to work, the air can be turned into the air brake, and the steel band tightened until not a wheel in the whole machine can turn. In the construction of this great wheel every

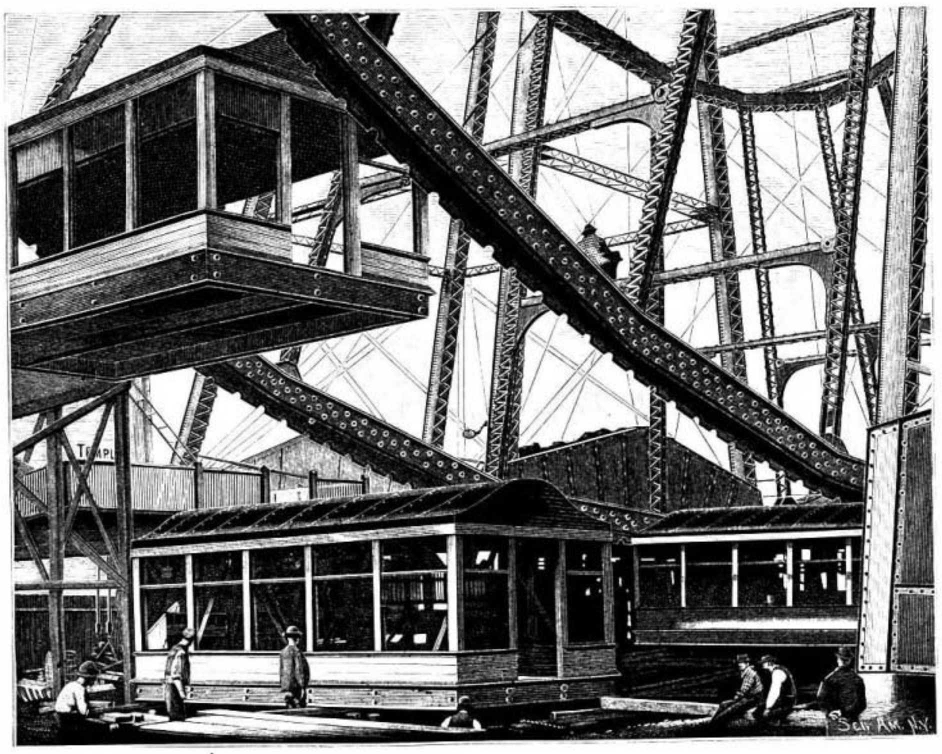


THE WORLD'S COLUMBIAN EXPOSITION—SCAFFOLDING EMPLOYED IN THE ERECTION OF THE GREAT FERRIS WHEEL.

conceivable danger has been calculated and provided for. Windage was a matter of the greatest importance, for, although the wheel itself is all open work, the cars present an immense resisting surface. But Mr. Rice points to the two towers, with their bases fifty feet north and south of the wheel, and bolted into twenty feet of concrete, and says that a gale of 100 miles an hour would have no effect. He says that all the frost and snow that could adhere to the wheel in winter would not affect it; and that if struck by lightning it would absorb and dissipate the thunderbolt so that it would not be felt.

It is arranged to empty and refill six cars with passengers at a time, so that there will be six stops in every revolution. Accordingly six railed platforms, of varying heights, have been provided on the north side of the wheel, and six more, corresponding with these, on the south side of it. When the wheel stops, each of the six lowest cars will have a platform at each of its doors. The passengers will step out of the south doors and other passengers will step in at the north doors. Then the next six cars will be served the same way, and the next and the next all day, and perhaps all night. It is expected that the wheel will revolve only once in every twenty minutes. Passengers will remain on board during two revolutions and pay fifty cents for their fun.

The Ferris Wheel Co. was capitalized at $600,000, and $300,000 worth of bonds were issued and sold. The final concession for the erection of the wheel was not granted until December, and all the work has been contracted for and done since then, the iron having been in the pig in January, while the scaffolding was not begun until March 20. By the terms of the concession, the company pays to the Exposition one-half of all its receipts after they have amounted to the cost of the wheel. On the day the wheel was first started, June 21, 5,000 guests were present at the inaugural ceremonies, all of whom were given a ride on the great wheel. The motion of the machinery is said to have been almost imperceptible.



THE GREAT FERRIS WHEEL AT CHICAGO—ATTACHING THE CARS.

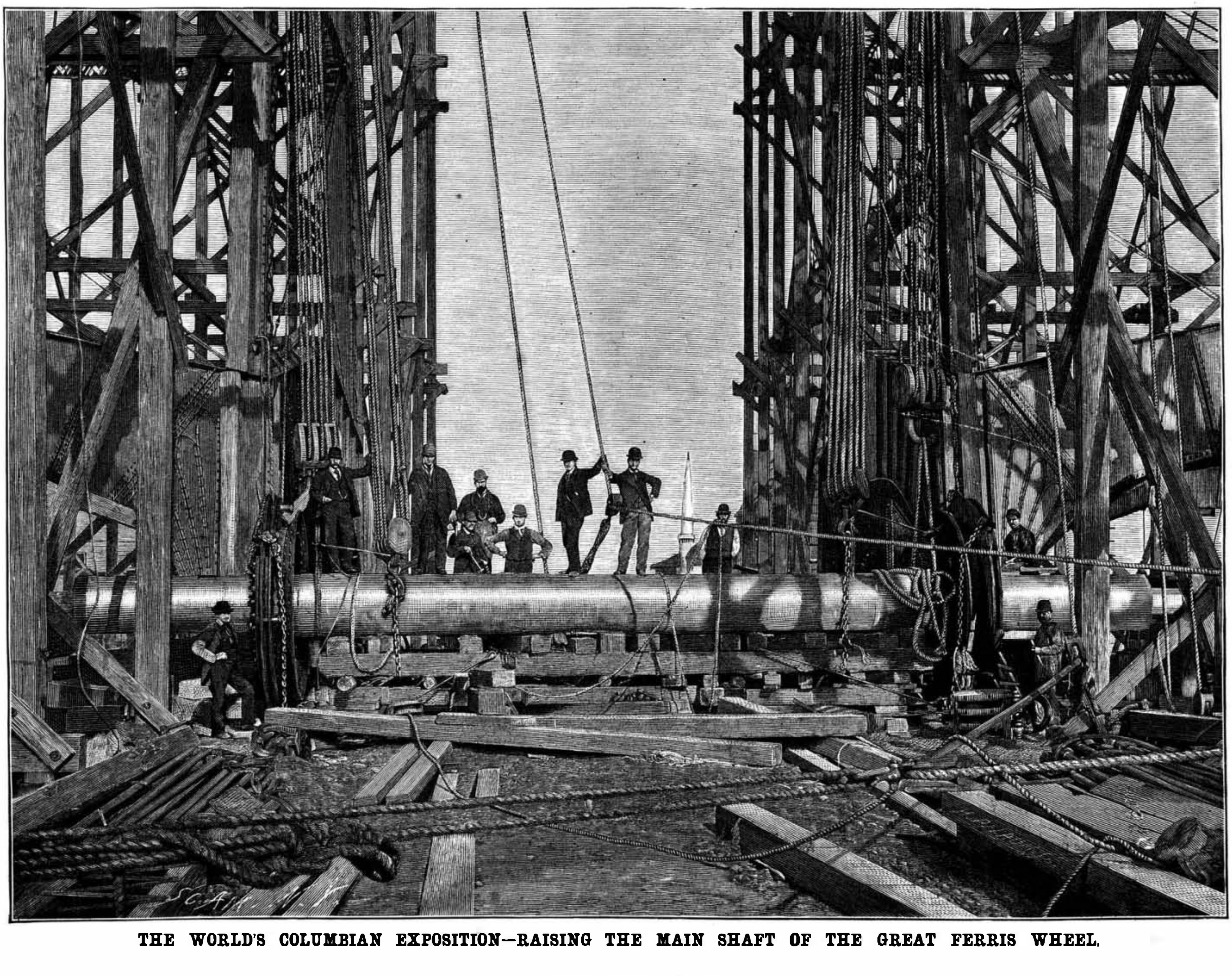
Tar and Asphalt for Tanks.

A mixture of coal tar and Californian rock asphaltum has been successfully employed by Mr. R. C. Gemmell for lining a reservoir for the city water works of La Grande, Oregon. The reservoir is of oval shape, part in excavation in heavy clayey soil and part in embankment made from the excavated material, with inner slopes of three to one. The depth of water is ten feet; the area of surface, 20,880 square feet; and the capacity, 1,000,000 gallons. The lining consists of one layer of brick on edge, covered by three-eighths inch of the bitumen mixture. After the earth had been excavated and the embankment made, the whole surface was thoroughly rammed with iron punners weighing twenty-five pounds each. The bricks were then laid, and rammed solidly into place; the joints and cracks being brushed full of clean sand. Coal tar was used as a flux for the asphalt, in the proportion of from ten to twelve per cent by weight of the latter; the mixture being "cooked" by boiling for five or six hours with constant stirring. A large bucketful at a time was taken out of the kettle by two men, and spread in a thin layer over the bricks by means of shovel and broom. It required two layers put on in this way to make the requisite thickness of three-eighths inch. As much sand as would adhere to it was sprinkled over the last layer while hot. The reservoir has never leaked. It is suggested that this way of rendering tanks water tight at small expense might be extensively used for sewage works, etc.

A Unique Musical Bedstead.

A Bombay man has constructed a bedstead priced at 10,000 rupees, and *The Ironmonger* appends the description as follows: "It has at its four corners four full-sized gaudily-dressed Grecian damsels, those at the head holding banjos, while those on the right and left foot hold fans.

Beneath the cot is a musical box, which extends the whole length of the cot, and is capable of playing twelve different charming airs. The music begins the moment the least pressure has been brought to bear from the top, which is created by one sleeping or sitting, and ceases the moment the individual rises. While the music is in progress the lady banjoists at the head manipulate the strings with their fingers and move their heads, while the two Grecian damsels at the bottom fan the sleeper to sleep. There is a button at the foot of the cot which, after a little pressure, brings about a cessation of the music, if such be the desire of the occupant."



THE WORLD'S COLUMBIAN EXPOSITION—RAISING THE MAIN SHAFT OF THE GREAT FERRIS WHEEL.

Natural History Notes.

Fecundity of Some of the Sea Fishes.—In the "Annual Report of the Fishery Board of Scotland," Mr. Wemyss Fulton states that more than a hundred examples have been observed that go to show the great fecundity of sea fishes. The number of the eggs of thirty-nine species has already been estimated. This number varies considerably, according to the size and age of the individual. Of all the fishes, the ling (*Molva vulgaris*) produces the greatest number of eggs, say from twenty to thirty million.

The gurnard (*Trigla lyra*) produces but a few hundred, that are taken care of by the male, which places them in a pocket situated near his abdomen.

The cod (*Morrhua vulgaris*) produces all the way from two to eight million eggs; the haddock (*Gadus æglefinus*) about two or three hundred thousand, and even a million; and the coal fish (*Gadus virens*) from four to eight million. In the herring (*Clupea harengus*) the number amounts to from twenty to fifty thousand. Out of sixteen specimens examined, the mean exceeded thirty thousand. Hitherto such fecundity as this has not been admitted for this fish.

The turbot (*Rhombus maximus*) also is very fecund. It produces from three to ten million eggs.

Less productive is the dab (*Pleuronectes limanda*), which produces from thirty to sixty thousand eggs.

Proportionally to its size, the plaice (*Pleuronectes flesus*) produces more than all others, the number of its eggs being five hundred thousand or a million and a half.

The sole (*Solea vulgaris*) is very productive, but, as with a large number of other species, the quantity of its eggs has not yet been estimated.

The Silk of Spiders.—In the *Revue des Sciences Naturelles Appliquées* for March, 1892, there is a paper by Rev. P. Camboue on the silk of spiders. After giving a history of the attempts to obtain and use the silk of spiders, he gives some interesting experiments of his own, made on a large orb-weaving spider of Madagascar (*Nephila madagascariensis*, Vinson). He finds that the spider furnishes the most silk after she has laid her eggs. From one spider there was obtained in twenty-seven days nearly four thousand meters of silk. The silk was of a golden yellow color. He gives the plan of an apparatus for winding the silk, which, however, as he says, is imperfect. Nothing, however, was done as to the raising and keeping of the spiders in large numbers, undoubtedly the most serious question. —*Insect Life.*

A Fish-Eating Rodent.—A very interesting new mammal has recently been received at the British Museum in the form of a fish-eating rat from the mountain streams of Central Peru. The animal is of about the size of a common house rat, but has a flattened head, strong and numerous whisker bristles, and very small eyes and ears, characters which give it a striking resemblance in its physiognomy to some of the aquatic genera of the Insectivora and Carnivora, such as *Potamogale*, *Myogale*, *Lutra*, or *Cynogale*. Its swimming powers are evidently very great, as is shown, among other things, by its broad, webbed and strongly ciliated hind feet, far better developed for this purpose than are those of the ordinary swimming Muridæ, such as the English water vole, whose simple vegetarian diet does not necessitate the development of any exceptional swimming powers. In color, like the common water shrew, it has a dark upper side with a whitish belly, and has a markedly bicolor black and white tail.

The chief interest of the new form centers in the fact of its being wholly a fish-eater, and in its having in connection therewith its incisor teeth modified for catching a slippery, active prey by the development of their outer corners into long sharp points, and its intestines altered by the reduction almost to *nil* of its cæcum, an organ in vegetarian Muridæ always of great size and capacity. The stomach of the single specimen obtained contains fish scales, recognized by Mr. Boulenger as those of *Tetragonopterus alosa*, a fish whose average length is about six inches.

This animal represents quite a new departure in rodent life history, for although it is now perfectly well known that the North American musquash (*Fiber zibethicus*) occasionally feeds on fish caught by itself, yet there is no other rodent which, as in the case of *Ichthyomys stolzmanni*, as it is proposed to term the new form, wholly lives on fish, to the exclusion of a vegetable diet.

Variation in Species of Plants.—Dr. E. Sickenberger, professor of chemistry, botany, and materia medica at Cairo, in a letter to a correspondent, states that he has several times had the opportunity of substantiating the facts that, in Egypt, seeds of *Gignut*(?), a variety of *Cannabis sativa* from Europe, produce the true *C. sativa* yarn by the third generation; the black mustard, *Brassica nigra*, is transformed in the second generation into the endemic *B. bracteolata*, Fisch. et Mey; and the thick-rooted celery assumes in the first year the much foliated form with a thin root stock, like the summer spontaneous form in Egypt.

Local Names of Common Insects.—Several times in the columns of this journal, says *Insect Life*, we have solicited correspondence with regard to local names for our commoner insects, and a number of our correspondents have responded.

The most interesting information on this head has lately come to us from Mr. Alvah A. Eaton, who sends quite a list of names current between Newburyport, Mass., and Portsmouth, N. H. Some of them are entirely new, and are probably quite local. The walking stick (*Diapheromera*) is there known as "scorpion." The term "huckleberry bug" is used indiscriminately for a species of red mite and for soldier bugs, just as "red bug" is applied in the South to mites and the cotton stainer. May beetles and the like are called dor bugs, an old English name for this class of Scarabæids. "Crackamire" and "needle ichneumon" are the names given the long, slender ichneumon flies. The large Locustidæ, or long-horn grasshoppers, are very appropriately called "cradlers," from the resemblance of the ovipositor of the female to a grain cradle; but most singular of all is the application of the name of locust to the large Bombycid moths, such as the *Cecropia*, *Luna*, and *Polyphemus*, and of lady-bird for the Sesiid or humming bird moths.

A New York correspondent writes that the carpet beetle, *Anthrenus scrophulariæ*, universally but incorrectly called "buffalo moth," is known in certain towns along the Hudson as "Russian months."

The different names that have been proposed for the *Acanthia lectularia*, the insect which "has no wings at all," but which makes its presence felt notwithstanding, will fill several pages. Around Boston these torments are called "chintzes" and "chinches," and from Baltimore we get the name "mahogany flats," but in New York they speak of them as "red coats."

Ant Communities.—Sir John Lubbock, in a recent lecture on the "Habits of Ants," said that the question naturally arose whether ants were moral and accountable beings. They had their desires, their passions—even their caprices. The young were absolutely helpless. Their communities were sometimes so numerous that, perhaps, London and Pekin were almost the only cities which could compare with them. Moreover, their nests were no mere collections of independent individuals, nor even temporary associations, like the flocks of migratory birds, but organized communities, laboring with the utmost harmony for the common good. The remarkable analogies which to our human societies they presented in so many ways rendered them peculiarly interesting to us, and one could not but long to know more of their character, how the world appeared to them, and to what extent they were conscious and reasonable beings. Various observers had recorded, in the case of ants, instances of attachment and affection. He had never, in the whole course of his observations, noticed a quarrel between two ants belonging to the same nest. Within the limits of the community all was harmony. On the other hand, it must be confessed that ants not belonging to the same nest were always enemies, even if belonging to the same species. Sir John went on to give details of a number of interesting experiments and observations which, he contended, might be held to prove the possession by the ant of an almost human intelligence. One result which he deduced was, that even in the largest nests the ants all recognized their companions. He had invariably found that if a strange ant, even of the same species, was introduced into a nest, she was sure to be attacked and driven out. He had also made some experiments on the power possessed by ants of remembering their friends, and he found that after a year's separation they did so.

The Natural Enemy of the Spider.—The ichneumon fly of Ceylon is the natural enemy of the spider. The insect is green in color, and in form resembles a wasp with a marvelously thin waist. It makes its nest of well-worked clay, and then goes out on a hunting expedition. Its victims are invariably spiders of various kinds, but all are subject to the same mode of treatment. A scientific sting injects some poison which effectually paralyzes the luckless spider, which is then carried off to the nest and there fastened with a dab of moist clay.

Another and another victim is brought to this chamber of horrors. Then the prescient mother ichneumon fly proceeds to deposit her eggs, one in the body of each spider, which can just move its legs in a vague, aimless manner, but can offer no resistance. This done, the fly returns to her work as a mason. She prepares more clay and builds up the entrance to this ghastly cell. Then she commences a new cell, which she furnishes in like manner, and closes; then she adds yet another cell, and so proceeds until her store of eggs are all provided for, and her task in life being accomplished she dies, leaving her evil brood to hatch at leisure. In due time these horrid little maggots come to life and find themselves cradled in a larder of fresh meat. Each poor spider is still alive, and his juices afford nutriment for the ichneumon grub, until it is ready to pass into its chrysalis stage, thence to emerge as a winged fly, fully prepared to carry out the traditions of its ancestors with regard to spiders and fulfill the purpose for which they have been created, according to ichneumon belief.

The Smallest Insect Known.—The editor of *Insect Life*, in answer to a correspondent, says that, so far as known, the smallest true insect that has ever been described is *Alaptus excisus*, Westw., a minute parasitic Hymenopteron, which occurs in England. Its length is seventeen-hundredths of a millimeter, or from six to seven thousandths of an inch, and it is of slender form. This little species is probably parasitic in the eggs of some bark louse. It is quite likely that there exist other species still smaller, but if so they have escaped the eye of the entomologist up to the present time.

The Edible Qualities of Ants.—It has long been known that the formic acid present in ants in such quantity is normally of such strength that it is not disagreeable to the palate. As a boy, Mr. Howard, the entomologist, tried the experiment of crushing ants with sugar and water as a substitute for lemonade, and recollects that it was drunk with relish by his companions. A correspondent of *Insect Life* has written recently that one of her hired men is in the habit of eating large black ants found in rotten wood. She also states that her father, after eating a large section of railroad restaurant pie in the dark, and noticing an agreeable acid flavor, found that the remainder was swarming with specimens of the little red ant (*Monomorium pharaonis*), and that he must have eaten some hundreds of individuals. He was satisfied with his experience, which he did not repeat voluntarily, but he vouches for the edibility of this species. What the original ingredients of the pie were is not stated, but the effect of the combination was to make it about as sour as rhubarb.

Kyphosis Bicyclistarum.

One evil traceable to bicycling is the confirmed stoop which has already declared itself in many wheelmen, a result so common in the less strongly built bicyclists of the Continent as to have found its way into classification as the "kyphosis bicyclistarum."

The dorsal curvature posteriorly, which used to be rare in boys under 14 years of age, is, now that the bicycle is so largely used, very frequently met with, particularly amongthose young bicyclists whose spinal column is developing more rapidly than the ligaments and muscles, and in whose case, therefore, the equilibrium between those parts is more or less disturbed.

Were it merely an unsightly deformity, the stoop in question ought to be combated in every way; but confirmed dorsal curvature posteriorly has consequences of its own quite mischievous enough to call for immediate counteraction. The displacement, embarrassed functional activity, and arrested or diseased development of these organs, which kyphosis inevitably induces, are all too serious to warrant the slightest neglect in remedying them.

Exercise of a kind to accustom the spinal column to an action directly antagonistic to the inclination forward of the bicyclist's attitude is what is needed. The use of the Indian clubs or such similar means of incurvating the spine anteriorly, throwing out the chest and maintaining the head erect, should be practiced with that object. All the undoubted advantages of bicycling may thus be retained, without that cultivation of the stoop which tends to take a cubit from the stature of its inveterate exponents and to impose a hunchbacked development on what it would then be a figure of speech to call the rising generation.—*Lancet.*

The Great Seal Controversy.

Sir Charles Russell finished his long argument in the Behring Sea case recently. In concluding he said that this was the first occasion upon which a nation had claimed property in a free-swimming animal. The contention, he declared, was untenable, its advancement was derogatory to the principle of freedom of the seas, and it was extravagant and unfounded pretension that international law sanctioned the seizure and condemnation of the vessels of a friendly power. In his peroration he dwelt upon the importance of the arbitration submitted to by the two great powers, one representing Old World civilization, great in extent of dominion and greater in long-enduring traditions of liberty; the other a young but stalwart member of the family of nations, great also in territory and almost boundless in the resources, genius and enterprise of its people, and possessing enormous powers for good in the future of the human race. Their presence as friendly litigants, he said, was a fact of great moral significance, and their submission to arbitration was a victory for peace, as the award would be if it left the principles of international law untouched. Sir Charles was followed by ex-Attorney-General Webster, who insisted that the questions of rights and regulations were distinctly demarkated by treaty.—*Bradstreet's.*

THE tide tables for the Atlantic coast of the United States, together with 207 stations on the Atlantic coast of British America, for the year 1894, published by the United States Coast and Geodetic Survey, are now ready for issue, and copies can be obtained at the agencies of the survey in this city, or by addressing the office at Washington. Price 25 cents.

To Europe in Four Days.

Mr. J. H. Biles, the designer of the steamers Paris and New York, expresses in the *North American Review* the belief that within ten years a vessel can "leave New York at noon and arrive at Southampton at noon on the fourth day out." To do this, however, will require the enormous speed of thirty knots an hour.

For the attainment of this speed, Mr. Biles relies on no factors wholly untried, but on the adoption for ocean voyages of some that are now familiar but costly. The first is the further increase of mechanism in proportion to the total tonnage, by carrying a smaller weight of cargo and a larger weight of machinery. Could our fastest ships replace their cargo by motive power, they could add, says this accredited but highly sanguine critic, from one and a half to two knots an hour to their speed. Or if, instead of carrying 1,000 to 1,500 tons of cargo, as now, their capability was made less by 500 tons, replacing this by additional motive power, they would add a knot an hour to their speed. But it has not hitherto been deemed commercially wise so to sacrifice cargo to passengers and speed. We shall not stop to consider the reduction of the voyage by running to Halifax instead of to New York.

A second and a great source of gain, then, is in the lightening of the engines and other paraphernalia of power through the use of a lighter metal, such, for example, as nickel steel. This now costs much more than mild steel, but is 40 to 50 per cent stronger; it also costs no more now than that steel did in 1875. If this metal can replace steel in our best vessels, it will add, according to Mr. Biles, a knot an hour.

The process of getting more work out of the same weight of machinery also goes on gradually, while as to boilers there is hope of a far more important advance. Even now some types do three times as much work per ton as others, but could a light boiler be found that would do as good work, this problem of gain would be solved. If the locomotive type of boiler, which is one of the lightest of tubular boilers, or those having the fire inside the tubes and the water outside, give on long voyages two-thirds of their relative superiority on trial or as used in torpedo boats, another gain of over a knot an hour will result. There are also the tubulous boilers, with the water inside the tubes and the fire outside, whose performance, says Mr. Biles, "in relation to weight is much better than any of the tubular type;" and their development, which is especially looked for in America, will certainly bring higher speed.

Then there is fuel. Improved combustion by forced draught and other devices may be counted upon, but should oil be substituted for coal, the weight carried will be reduced one half, and this saving alone will give "a knot and a half more speed." The oil costs more, and this cost would increase when the supply diminished with the enormous quantities used by steamships; and it would also be necessary to accustom passengers to the idea that the oil is safe as a fuel.

Bigger ships will also be faster. Length is most important for this purpose, and some forms of vessels can actually be made to go faster with the same engine power by adding to their length, though this is not true of our best Atlantic liners. Yet even with the latter an addition of fifty feet would require only four per cent more engine power to attain the same speed, and would yield ten per cent more money-earning capability. As to draught, an increase from the usual twenty-six feet to thirty feet would add one and a quarter knots more, with a gain of eight hours on the run across. But, of course, in this matter, harbor and dock facilities must be considered.

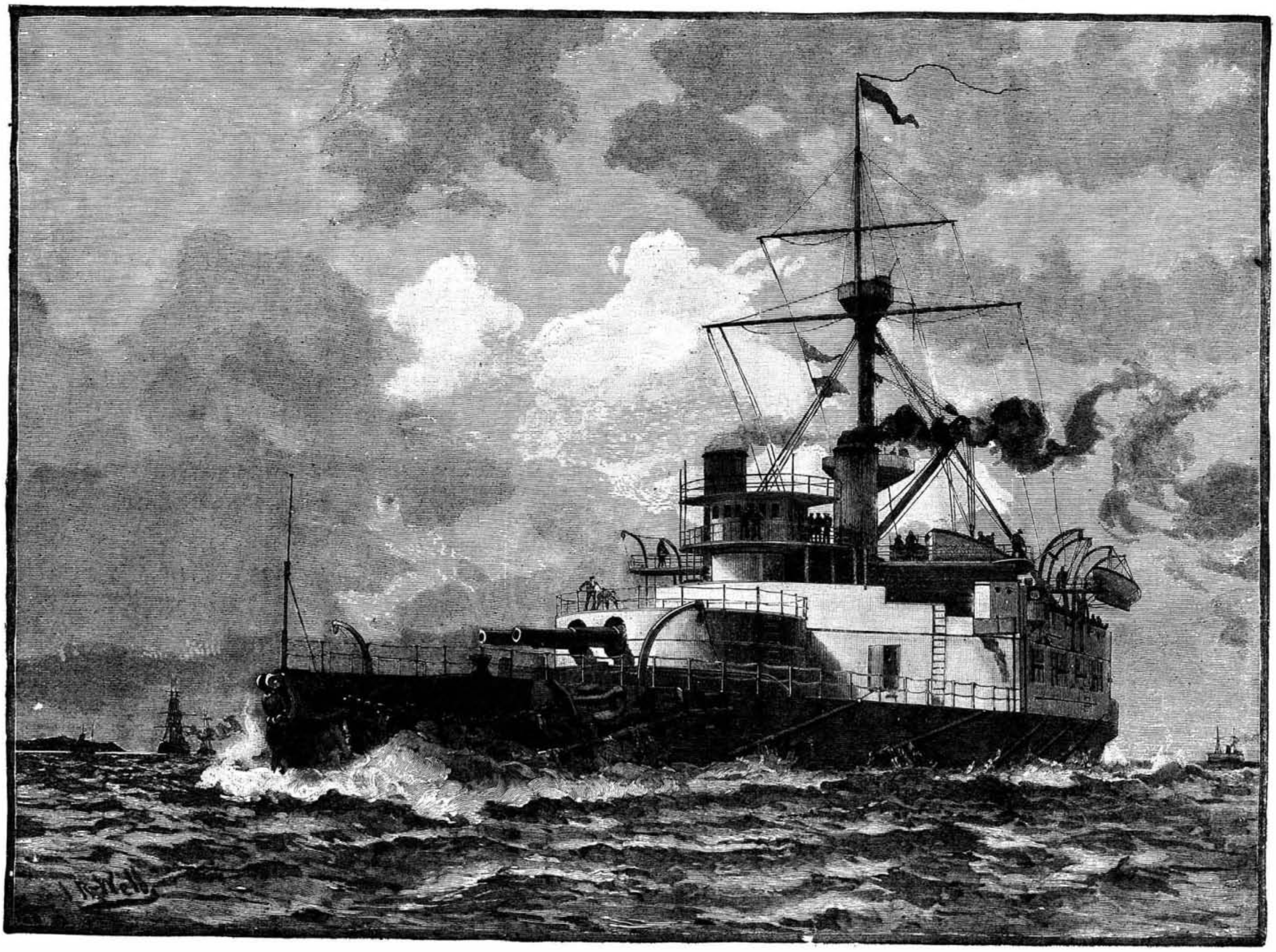
In fine, should nickel steel be cheap enough for use in engines and should a light boiler be secured for long voyages, the speed may be increased by two knots, while oil as fuel would carry the gain to three and a half, which would reduce the time record between Sandy Hook and Queenstown from five days fifteen hours to four days sixteen hours. Increase the length of the vessel to 1,000 feet, its width to 100, and its draught to 30, and it will make 30 knots an hour, and "be capable of crossing the Atlantic in a little over four days."—*N. Y. Sun.*

Boiler Covering and the Consumption of Coal.

Some experiments on the influence of boiler coverings on the consumption of fuel have just been concluded on the railways of southwest Russia. It was found that cooling was more rapid while working than when stationary, save when a double covering of felt was used. The heat lost in twenty-four hours by a boiler with 80 square meters of surface containing water at a temperature of 144°, and exposed to an exterior temperature of 8·5°, corresponded to 183 kilos. of coal if the boiler were uncovered, to 153 kilos. if there were a thin metal covering, to 130 kilos. if there were a double felt covering, and to 103 kilos. in the case of a cork covering. For an average daily consumption of 1,164 kilos., the cooling of the boiler represented about 24 per cent and 8·1 per cent of the consumption of coal.

The Most Costly Light Known.

Perhaps the most costly artificial light ever produced as an incident of scientific research, the *Journal of Gas Lighting* says, is that of the diamond burning in oxygen, as exhibited by M. Moissan in the course of his investigations into the different peculiarities of the diamondiferous forms of carbon. The action of oxygen upon the diamond has long been known; but hitherto no precise data concerning the temperature of combustion has been obtained. In order to ascertain the missing information, M. Moissan has employed a modification of the Le Chatelier pyrometer, placed along with the diamond in a wide porcelain tube closed at the end by glass plates through which the combustion in oxygen could be observed. It was first found in this way that, when the temperature is slowly raised under these conditions, the combustion of the diamond proceeds slowly, without the production of light. But if the temperature is raised to forty degrees or fifty degrees above the point at which this slow combustion commences, a sudden incandescence occurs, and the diamond appears surrounded by a brilliant flame. Various deeply colored specimens of diamonds burnt with production of incandescence and flame at temperatures of from 690 degrees to 720 degrees C.; but transparent Brazilian diamonds did not attain the stage of slow combustion without incandescence until the temperature of 760 degrees to 770 degrees C. was reached. Specimens of exceedingly hard bort commenced to combine with oxygen at 790 degrees C., and burnt brilliantly at from 840 degrees to 875 degrees C. When Cape diamonds were heated to a temperature of 1,200 degrees C. in a current of hydrogen, they remained unchanged; but if the stones had previously been cut, they frequently lost their brilliancy and transparency. It is a curious fact that metallic iron at its melting point combines with the diamond in a most energetic manner, and crystals of graphite are deposited in the mixture as it cools. Hence the experiment forms a striking mode of converting the allotropic form of carbon, which crystallizes in the cubic system, into that which crystallizes in the hexagonal system.



H. M. FIRST CLASS BATTLE SHIP VICTORIA, RECENTLY LOST OFF TRIPOLI.—[See page 2.]