

SCIENTIFIC AMERICAN

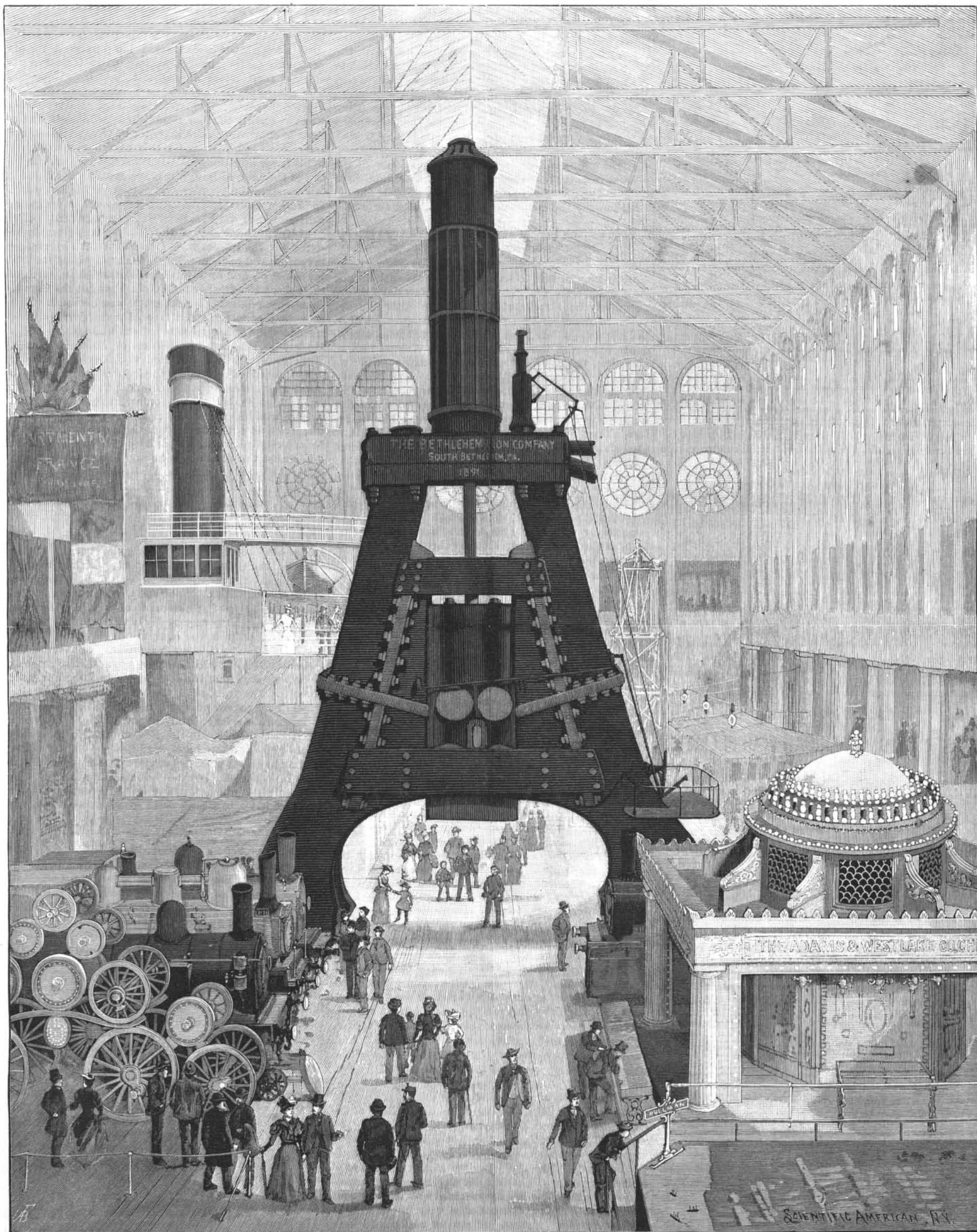
[Entered at the Post Office of New York, N. Y., as Second Class matter. Copyrighted, 1893, by Munn & Co.]

A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

Vol. LXIX.—No. 6.
ESTABLISHED 1845.

NEW YORK, AUGUST 5, 1893.

\$3.00 A YEAR.
WEEKLY.



THE WORLD'S COLUMBIAN EXPOSITION—THE FRENCH LOCOMOTIVE EXHIBIT—THE BETHLEHEM IRON CO.'S EXHIBIT.—[See p. 87.]

000,000 miles further from him than when in perihelion. As he is less than three weeks from his conjunction with the sun, he is also at nearly his greatest distance from the earth. At his opposition last August, which was near his perihelion, he was 35,000,000 miles from the earth, and his diameter was 26".6. At his aphelion on the 16th he is nearly 247,000,000 miles from the earth, and his diameter is 3".8. The apparent brilliancy of the planet must, therefore, vary greatly from the immense changes of distance.

The moon, the day after her change, is in conjunction with Mars on the 12th at 3 h. 31 m. A. M., being 3° 14' north.

The right ascension of Mars on the 1st is 9 h. 34 m.; his declination is 15° 43', his diameter is 3".8, and he is in the constellation Cancer.

Mars sets on the 1st at 7 h. 44 m. P. M. On the 31st he sets at 6 h. 34 m. P. M.

URANUS

is evening star. He is moving eastward or in direct motion, and must be looked for, with the aid of a telescope, between Alpha Libræ and Lambda Virginis.

The moon, two days before the first quarter, is in conjunction with Uranus on the 17th at 3 h. 11 m. P. M., being 1° 59' south.

The right ascension of Uranus on the 1st is 14 h. 18 m., his declination is 13° 23' south, his diameter is 3".7, and he is in the constellation Virgo.

Uranus sets on the 1st at 10 h. 43 m. P. M. On the 31st he sets at 8 h. 48 m. P. M.

NEPTUNE

is morning star. He has advanced in his course so far west of the sun, rising at the end of the month about 11 o'clock in the evening, that he is visible in large telescopes. He may be found about 4° north of Aldebaran.

The moon, three days after the last quarter, is in conjunction with Neptune on the 7th at 3 h. 31 m. A. M., being 5° 31' north.

The right ascension of Neptune on the 1st is 4 h. 47 m., his declination is 20° 53' north, his diameter is 2".5, and he is in the constellation Taurus.

Neptune rises on the 1st at 0 h. 45 m. A. M. On the 31st he rises at 10 h. 49 m. P. M.

Venus, Mars, Saturn and Uranus are evening stars at the close of the month. Mercury, Jupiter and Neptune are morning stars.

Nansen's Polar Expedition.

Dr. Nansen sailed from Christiania, Sweden, for the North Pole on June 26. The vessel which carries the expedition is the *Fram*, which was built, under the direction of Dr. Nansen, with a view to resisting the thrust of the ice-pack. This vessel is fully described in SUPPLEMENT 882. Provisions sufficient for five years are carried, though it is not expected that the trip will take as long as that. The vessel will follow as near as possible the path of the ill-fated *Jeannette*. It is believed that articles, which were afterward found in Greenland and which were identified as belonging to the *Jeannette* expedition were carried directly through the polar sea, passing the pole *en route*. Now Dr. Nansen believes that if he rams the *Fram* into the ice-pack, he will be carried in precisely the same manner as the articles from the *Jeannette*, and that finally he will land on the east coast of Greenland. This is an excellent theory, and there is considerable chance of its being the true one; but it remains to be seen if the *Fram* is strong enough to stand the enormous pressure which ground the *Jeannette* to pieces. Dr. Nansen estimates that three years will probably be necessary to allow for the drifting in the ice-pack. He fully expects to return, and we hope the brave explorer may do so.

Chinese Use of Towels.

It appears from the latest consular report from Swatow, in Southern China, that among cotton goods the import of towels alone has shown any improvement. But, the consul explains, this does not imply any increased attention to personal cleanliness on the part of the inhabitants of the district, for the towels are used for clothing. The breadth of the ordinary towel being that from shoulder to shoulder, two sewn together will make a coat. Sleeves are dispensed with, and except for the armholes there is none of that waste of material which is especially repugnant to the Chinaman, and which the size of his native piece goods and the fashion of his clothes conspire to avoid.

ONE of the most troublesome pests that inflict housekeepers are the red ants. And when they once get into a house, they are very difficult to dislodge. The writer had a trying experience with them for a long time. Every effort to get rid of them was without avail. In his dire extremity he applied to Sallade & Co., 53 West 24th Street, for relief. The result was the Sallach Company, with their insect exterminator, accomplished their work most satisfactorily and the house is free of ants.

THE FRENCH EXHIBIT OF LOCOMOTIVES.—THE BETHLEHEM IRON COMPANY'S EXHIBIT AT THE WORLD'S FAIR.

The Transportation building at the World's Columbian Exposition is justly popular, and is usually thronged with interested visitors. We have already illustrated the magnificent "golden gateway" of this great building, and we now present a view of the interior. The most striking object, and that which at once arrests the attention of every spectator, is the great model of the Bethlehem Iron Company's steam hammer. It occupies the center of the transept, and the open space below the hammer proper forms an archway of grand proportions. It is very appropriate that this modern "Colossus of Rhodes" should rise amid the models and sections of great ocean steamers and battle ships, which depend to so large an extent upon the products of the forge. The height of the hammer from floor to cylinder head is ninety-one feet. The anvil block is removed and exhibited at one side. The Bethlehem hammer, of which this is a model, is a 125 ton hammer, and one of the largest in the world. The plates of the seventeen-inch armor which recently stood very satisfactory tests at Indian Head, on the Potomac, were forged by means of this machine. The model is built of wood and staff, so cunningly fashioned that in outward appearance it resembles a mass of metal.

The exhibits of the Bethlehem Company near by are divided into three sections. In the first are the products of the hydraulic forging presses, two huge hollow steel forgings which form the barrel and jacket of a 13 inch navy gun. A smooth-forged trunnion hoop used for securing one of the new 12 inch, 50 ton army guns to the carriage is exhibited, also a 12 inch breech-loading rifle, made at the Washington Gun Factory, from the Bethlehem Company's fluid-pressed hydraulic-forged steel. This rifle, which has a muzzle velocity of 2,000 feet a second, weighs 45 tons and is 37 feet long. With a charge of 450 pounds of powder, an 850 pound projectile will perforate over 22 inches of iron. This little plaything has been christened "Alice."

In the second section of the exhibit is a model of a 113 ton steel ingot from which the colossal armor plates are forged. An extraordinary example of forging is a seven-foot ventilator for the monitor *Puritan*; this was forged in one piece without welds, the material nickel-steel. A seventeen-inch nickel-steel armor plate on exhibition is curved, showing the enormous power exerted by the great bending presses. A thirteen-inch plate of the battle ship *Indiana* is shown, as well as a case-hardened nickel-steel plate 10½ inches thick, which was used as a target for five 8 inch Holtzer shells; the plate was not seriously injured. A remarkable exhibit in this section is an ingot similar to the one from which the Ferris wheel shaft was forged. This ingot, which is 15 feet long and 54 inches in diameter, is made of fluid compressed steel and weighs over 48 tons. The shaft of the Ferris wheel was one of the largest forgings ever made, the ingot weighing 65 tons.

In section three is a hollow shaft, hydraulic forged, 67 feet long, 20 inches in diameter, and weighs 30 tons. This shaft is identical with the one furnished the Old Colony steamer *Puritan*. A counterbalanced crank for the City of Sydney, a Pacific Mail Steamship Company's steamer, is a good example of built up work. In addition to a solid crank for the cruiser *Minneapolis* a quantity of air cushion cylinders, billets, ingots, etc., are exhibited. On the whole, the exhibit of the Bethlehem Company does the highest credit to that enterprising corporation. The various products shown are exquisitely finished.

At the left, and beyond the hammer, will be seen the black and white stack of the International Navigation Company's steamer, or, rather, section of a steamer. This section might be called on the theater stage "practicable," for visitors are allowed to wander at will through the saloon, smoking room, and cabin.

At the right of our engraving will be seen the artistic pavilion of the Adams & Westlake Company of Chicago, manufacturers of railway car supplies. The pavilion is built of wood and staff and is highly artistic. The Adams & Westlake Company are the largest manufacturers in the world of brass, bronze, and white metal car trimmings. Railroad lamps are a specialty with this firm, and include car lamps, headlights, tail lamps, signal lamps, and lanterns. Car window curtains, baggage racks, coat hooks, and the thousand and one articles of railway hardware are all supplied by this firm.

At the extreme right will be noticed a part of the model of the city of Pullman, which forms a very interesting exhibit. This industrial city was founded by George M. Pullman, and, though established only thirteen years ago, the population already numbers more than 8,000. Pullman is in the city of Chicago, though fourteen miles from the City Hall, and is located on the Illinois Central Railway. Here are centered the great interests of the Pullman Palace Car Company, the Allen Paper Car Wheel Company, the brick works, etc. It was pre-eminently the

design of the founder to build a city in which, as far as possible, all that would promote the health, comfort, and convenience of a large working population would be conserved, and many of the evils to which they are ordinarily exposed made impossible, while at the same time conducting the enterprise on sound business principles, looking for a moderate and sure return on the capital invested. Pullman is in many ways a model town; the wide, clean streets, the excellent water and sewage pumping systems render Pullman a healthy and pleasant place to live in. The town is well worthy of a visit, and, with proper introductions presented at the Chicago office, there is no difficulty in obtaining permission to visit the interesting shops of the company. The great Centennial Corliss engine runs the works. The model exhibited in the Transportation building gives an excellent idea of the way the town is laid out and of the principal buildings.

One of the most noticeable and unique exhibits in the Transportation building stands in the space allotted to French exhibits, just south of the center of the building and east of the main aisle, near the great hammer. This exhibit consists of a pyramid of wrought iron locomotive and car wheels of all descriptions, partly shown in our engraving. The wheels exhibited are of various sizes and designs, as can be seen from the illustration, and are all made in the Couzons works of Arbel, at Rive de Gier, France.

The *Railway Review* says the works, as they now exist, are specially fitted for making wrought iron wheels, forged under the steam hammer, and can make wheels of every size from those of 9¼ inches in diameter, for use under mine trucks, up to high speed locomotive wheels of 87 inches in diameter. Between 300 and 400 men are employed, gas heating furnaces are used, and also every other new improvement which the business demands. By these improvements the company are enabled to guarantee a service for their wheels of 300,000 miles.

The process of manufacturing the car wheels in the Couzons works is practically as follows: The rim is first cut to length, bent to the proper radius and the ends welded, the welding being partially accomplished by means of a screw clamp while the rim is in the fire. The rim is then divided into as many equal parts as the wheel is to have spokes, and by means of a special shaping machine grooves are cut, which receive them. The spokes are rolled to an elliptical shape, cut to the proper length and upset on the ends to form the proper foot for welding, this work being done vertically in a special die prepared for the purpose.

The hub is made in halves, and each half is formed of a rectangular iron bar, rolled around a conical mandrel under the steam hammer. The pieces are then reheated, put under the steam hammer, and recesses stamped therein for receiving the spokes, after which the wheel is made up. In making up the wheels they are laid together as the wheel has considerable dish. This is done in order to insure a perfect weld in stamping, as the compression on the spokes forces the pieces of metal together.

The wheels, fitted as described, are transferred to a heated furnace, and the construction of these furnaces is one of the special features which Messrs. Arbel claim has much to do with the superiority of their wheels. Reverberating furnaces are used exclusively, and the flame never comes in direct contact with any portion of the wheel. The maximum intensity of heat is at the center of the wheel, and the furnace so arranged that the heat is transmitted regularly and gradually and thus all portions are brought to the welding heat at the same time, insuring that no parts are injured by being overheated or an imperfect weld caused by others being underheated. After the wheel has reached a welding heat it is lifted from the furnace and placed in a die on the anvil of the steam hammer. This die forms a mould for one half of the wheel, and another die fastened to the hammer head forms the other half. A few blows of the hammer are given the wheel, after which it is again heated and hammered, in order to insure all parts being perfectly welded. After the wheel has left the hammer it is cleaned of the fins, then passes to the turning and boring mills, after which it is ready for use.

The process used for the manufacture of driving wheels is very similar to that of car wheels. The rims are rolled and welded, and the spokes are stamped out to their finished shape under a steam hammer. The hub is formed by the inner end of the spokes; the different parts are then laid together, and a pile of iron of the proper dimensions for making the counterbalance and crank pin hub are laid in their proper respective positions. The wheel, while in this condition, is placed in a furnace, heated to a welding heat, placed in a die and struck several blows by the steam hammer, the same as with the car wheels. A second and sometimes a third heating and hammering is given each wheel before it is finished.

Several different types of wheel are manufactured by the company, practically all of which have been the outgrowth of the process described.