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THE CASTING OF A LARGE STEAM CYLINDER.

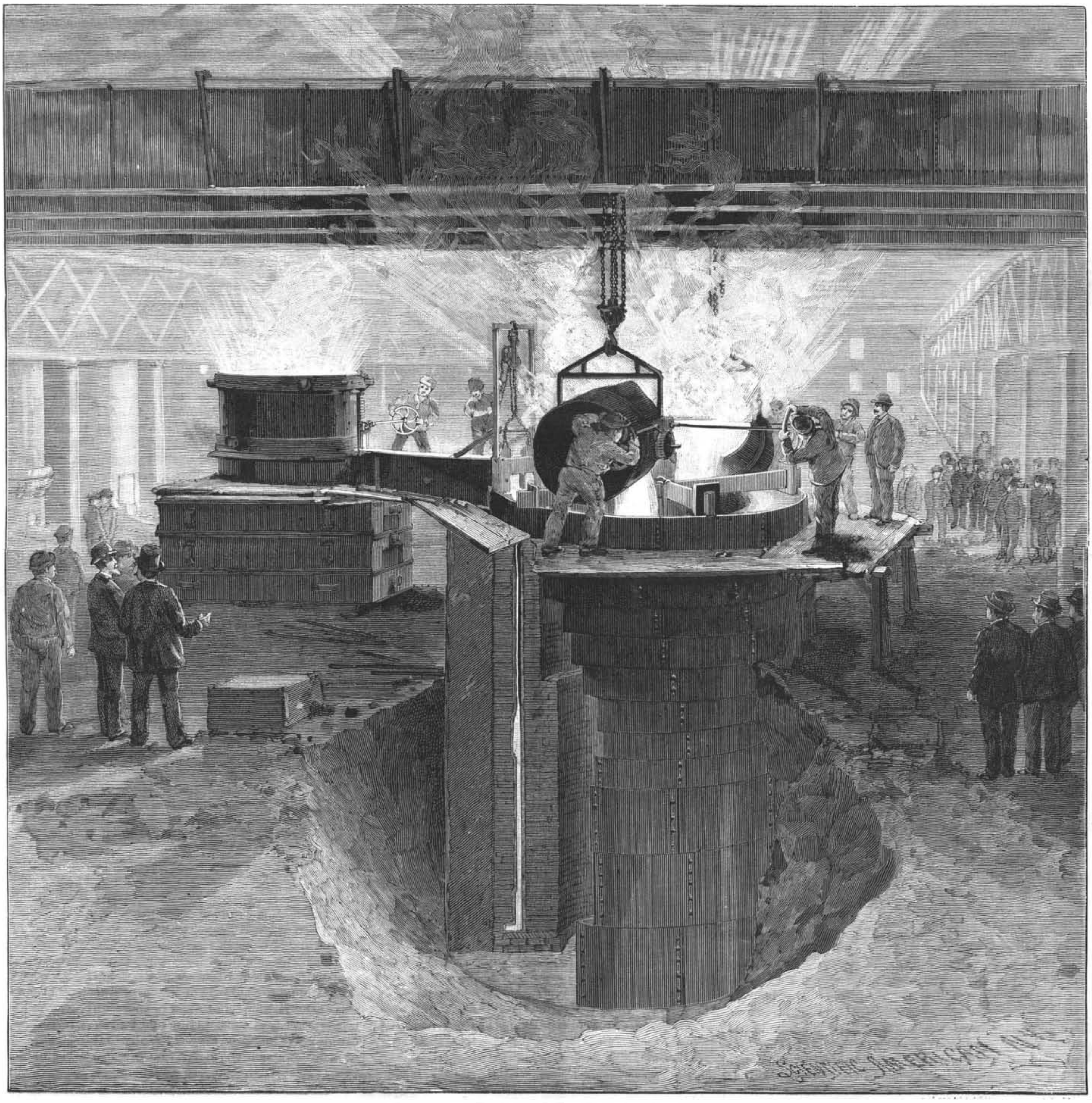
We illustrate in the present issue the operation of casting a very large steam cylinder—one of the largest ever made in this country. The operation was brought to a successful conclusion at the works of the Wheeler Condenser and Engineering Works, at Carteret, New Jersey, on January 26, 1893, a faultless casting resulting.

The mould was built of brick faced with a thin coating of loam, and the core and mould face were both shaped by sweeping. It was strengthened on the outside by iron plates, and the structure was carried up some feet above the foundry floor, as shown in the cut. The interior of the mould communicated by numerous down-takes with an annular trough near the top of the structure. Three large gates, each about 18 inches wide, communicated with the annular trough. The mould was liberally provided with air vents.

The iron used was a mixture of 1x lake and 1x charcoal pig iron and of A1 railroad scrap iron. A charge of twenty-six tons was melted in a cupola, and the melted iron was then distributed between three ladles, one standing ladle of fourteen tons capacity, one swinging ladle of ten tons capacity, and another swinging ladle of eight tons capacity. In preparing the charge the standing ladle was first filled and a period of two hours elapsed between its filling and tapping; in the other ladles the iron stood for a less period. The annular trough and connections were relied on to mix the three irons thoroughly before they entered the mould. The swinging ladles were manipulated by two Sellers overhead-traveling cranes, each of twenty tons capacity. The operation of pouring consumed less than one minute. Owing to the good venting of the mould, the melted iron ran in perfectly quietly. It is also noteworthy that all the preparations for the casting were complete half an hour before the stipulated time.

The weight of the cylinder in the rough was 48,000 pounds; its metal being some 2½ inches thick. After chipping and cleaning, which included removing of the heads, it weighed 45,720 pounds. It was cast so nearly the true size as to leave about ¼ of an inch skin to be removed in the boring. Its internal diameter is 95 inches and it is about 14 feet high, being calculated for an 11 foot stroke.

After remaining in the mould three days, it was re-



THE CASTING OF A LARGE STEAM CYLINDER.

moved still warm, and after cleaning up and chipping was shipped by rail from Carteret to Communipaw, N. J. Here the car containing it was run upon a railroad deck scow and was towed to the works of W. & A. Fletcher, Hoboken, N. J., the builders of the engine. The car in which it was shipped was especially cut out to receive it, but so large was the cylinder that it had but one inch clearance under some of the bridges.

Another cylinder, the mate of this one, has still to be cast. The cylinders are to go into a four-cylindered engine for a new Sound steamer for the Old Colony Steamboat Company. The engine is to be a double compound inclined engine, of 8,000 indicated horse power. Two cylinders such as the one described are for low pressure, and there are to be also two high pressure cylinders of 51 inches diameter, all of 11 foot stroke. The steamer is to have a length over all of 440 feet 6 inches and a width over the guards of 92 feet. She will displace at 12 feet draught 4,550 tons, and will be the largest steamer of her type in the world. The hull is being built at the yard of the Delaware River Iron Ship Building and Engine Company, Chester, Pa. It is to be launched about July 1, 1893. The boat is to be in service in 1894. The paddlewheels will be feathering, a type with which the Fletcher Company have become to some extent identified. As to some extent a prototype of this engine, the engine of the steamboat Plymouth may be referred to. (See SCIENTIFIC AMERICAN, October 4, 1890.)

Gelatine Dry Plate Photography.

The gelatine dry photo. plate process now so commonly used was first given to the world in practical form by John Burgess, of England. Various experiments by different photographers had been made previously with gelatine, but no one had succeeded in producing a definite and successful process until Mr. Burgess showed the way. The first announcement of the Burgess process, in this country, was given in the SCIENTIFIC AMERICAN of August 23, 1873, and reads as follows:

"New Photo Process.—A recent improvement, announced by Mr. Burgess, a photographic artist of Peckham, England, consists in sensitizing gelatine by means of bromide of silver. The mixture is applied warm to the glass plate, and the picture may be taken with the plate either wet or dry. The time of exposure is the same as for the ordinary wet collodion plates. The alkaline pyro. developer is used, the picture making its appearance rapidly, with any required degree of intensity. The new process promises to compete sharply with the ordinary collodion process."

Further details of the process were given in the SCIENTIFIC AMERICAN of December 13, 1873, quoted from the *British Journal of Photography*, as follows:

"*Dry Plate Photography with Gelatine.*—Place seven grains of Nelson's gelatine and seven grains of isinglass in cold water for several hours until soft and swollen, then drain off the water, and put them into a two ounce bottle, which place in hot water until the gelatine and isinglass are dissolved. Add thirteen grains of bromide of potassium, dissolved in a drachm of distilled water, and in another drachm of distilled water dissolve fourteen grains of nitrate of silver, and add it by degrees, in the dark, shaking well between each addition. Now add half a drachm of saturated solution of nitrate of baryta and two drops of muriatic acid. There will be a froth on the top of this emulsion from the shaking, and in order to get rid of this it may be strained through muslin, or if left in the hot water, it will gradually subside.

"This will form sufficient emulsion, at a cost of about two pence, to coat over one dozen quarter plates, which, as coated, should be laid on a flat surface until the film sets, which will take about five or ten minutes, when they can be put away in a box to dry. The drying will take about forty-eight hours (unless they are placed in a current of dry air), or they may be exposed at once. An exposure of thirty seconds, with alkaline developer, should give a negative of sufficient printing density without any intensifying. The plates should be placed in cold water for about a minute previous to developing.

"Emulsions prepared with the silver in excess caused the plates almost surely to fog, and the image to be very thin and faint."

An Omnibus with Pneumatic Tires.

The latest adaptation of pneumatic tires is to the wheels of an omnibus which is being tried by the Glasgow Tramway Company at Glasgow, Scotland. The tires are about 3½ inches diameter, and can withstand a pressure of 187 pounds to the square inch. To guard against any risk of the India rubber being punctured by sharp stones or otherwise, the tires are thoroughly protected by several plies of canvas, with a covering of wire-wove netting. The omnibus is said to be a very comfortable vehicle to ride in. The inside seats are mounted on springs, which adds to the comfort. There is an electric lamp fixed in the roof, supplied by a box underneath one of the seats containing a sufficient storage of electricity for 24 hours. Twelve passengers can be carried inside and 14 outside.

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(Illustrated articles are marked with an asterisk.)

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No. 897.

For the Week Ending March 11, 1893.

Price 10 cents. For sale by all newsdealers.

DELICACY OF A CERTAIN CHEMICAL TEST.

One of the most delicate tests known to chemical science is that in which potassium sulpho-cyanide is employed to discover the presence or absence of the element iron in a given solution. Potassium ferrocyanide is, perhaps, used more frequently, but gives much less satisfactory results. In cases where this salt failed to indicate the slightest trace, the sulphocyanide yielded a very evident proof of the presence of the element in question. The observance of this fact led to an attempt to ascertain as nearly as possible the actual value of the sulpho-cyanide as an iron test. The method adopted was very simple. A small quantity of polished iron wire was weighed out very accurately. In the actual process, 0·0347 gramme was taken. By considering the density of iron, it was found that this weight occupied a volume equal to 0·004458 cubic centimeter. This quantity of iron was now dissolved in hydrochloric acid and water and oxidized, forming ferric chloride, which was then diluted with a sufficient volume of water to yield a solution of one hundred cubic centimeters volume.

This was placed in a burette graduated to one-tenth centimeter, and three-tenths of a centimeter were drawn off, to which the potassium sulpho-cyanide test was applied, which imparted a reddish brown color to the liquid, indicating the presence of iron. The solution was then made more dilute and a second portion was tested. This process was continued until only a very faint tinge of red could be detected. A small quantity of water was again added and the test applied, which, however, did not indicate the presence of iron. The quantity of iron which was detected by the sulpho-cyanide on its last successful application was found to be no greater than forty-three one-hundred-millionths of a cubic centimeter, or thirty-three ten-millionths of a gramme. This seems, indeed, to be a wonderfully delicate test, but it is only necessary to call to mind the approximately determined weight of the molecule of iron to be struck with the crudeness and inaccuracy of our most delicate methods of qualitative analysis.

The weight of a molecule of hydrogen, as given by an eminent authority, is approximately 0·000,000,000, 000,000,000,000,04 of a gramme; by multiplying this inconceivably small number by fifty-five, the atomic weight of iron, we ascertain the weight of a molecule of iron—0·000,000,000,000,000,000,002,2 gramme. In the sulpho-cyanide test we were able to detect the presence of thirty-three ten-millionths of a gramme of iron; dividing this number by the weight of one molecule of iron, we find that this apparently delicate test is unable to indicate to our senses a less number of molecules than 1,500,000,000,000,000. When we consider that most of our so-called tests are much less accurate than this, it is evident that in our determinations it is impossible to reach the absolute truth.

THE NICARAGUA CANAL.

In view of the demands of the present trade carried on between the Atlantic and the Pacific slopes of North and South America, and of the flattering promises of a greatly increased traffic by the construction of a canal across Central America, the promoters of the Nicaragua Canal scheme ask the United States government to guarantee their securities, and thus father the enterprise and hasten the work of construction by giving the securities financial standing. Both the great political parties of the country have committed themselves in favor of encouraging the building of the canal. Yet, as much as the demands of commerce need the completion of an isthmian passage, it is a question whether the government should commit itself in favor of or against the guarantee asked for until more definite knowledge of the perfect feasibility of the engineering features of the scheme is to be had. The Panama experience is a lesson from which much can be learned, and no patriot American would want it duplicated in any American scheme in such hairbrained engineering plans.

There is little doubt but what the Nicaragua Canal can be constructed on the plans already conceived. But there are greater demands on engineering skill to so construct the canal that it can be maintained. The plans call for many dams of remarkable length and unusual height. There are to be several deep cuts. Then a considerable watershed is crossed at an angle. The climate of Nicaragua is tropical and the precipitation at times is enormous, in fact, far greater than the engineers of the Panama Canal seem to have dreamed of. Another feature of much consequence is the geological formation of the country, which needs most thorough study in such engineering work as deep, narrow cuts and the construction of long, high dams. Several appropriations have been made by Congress and been spent in making surveys of the several proposed routes across the Isthmus, but some of these questions—vital to the successful construction and maintenance of the canal—have not been answered fully to the satisfaction of some eminent engineers who are favorable to the canal scheme.

The experience of the government in building the Sault Ste. Marie Canal has shown that thought should