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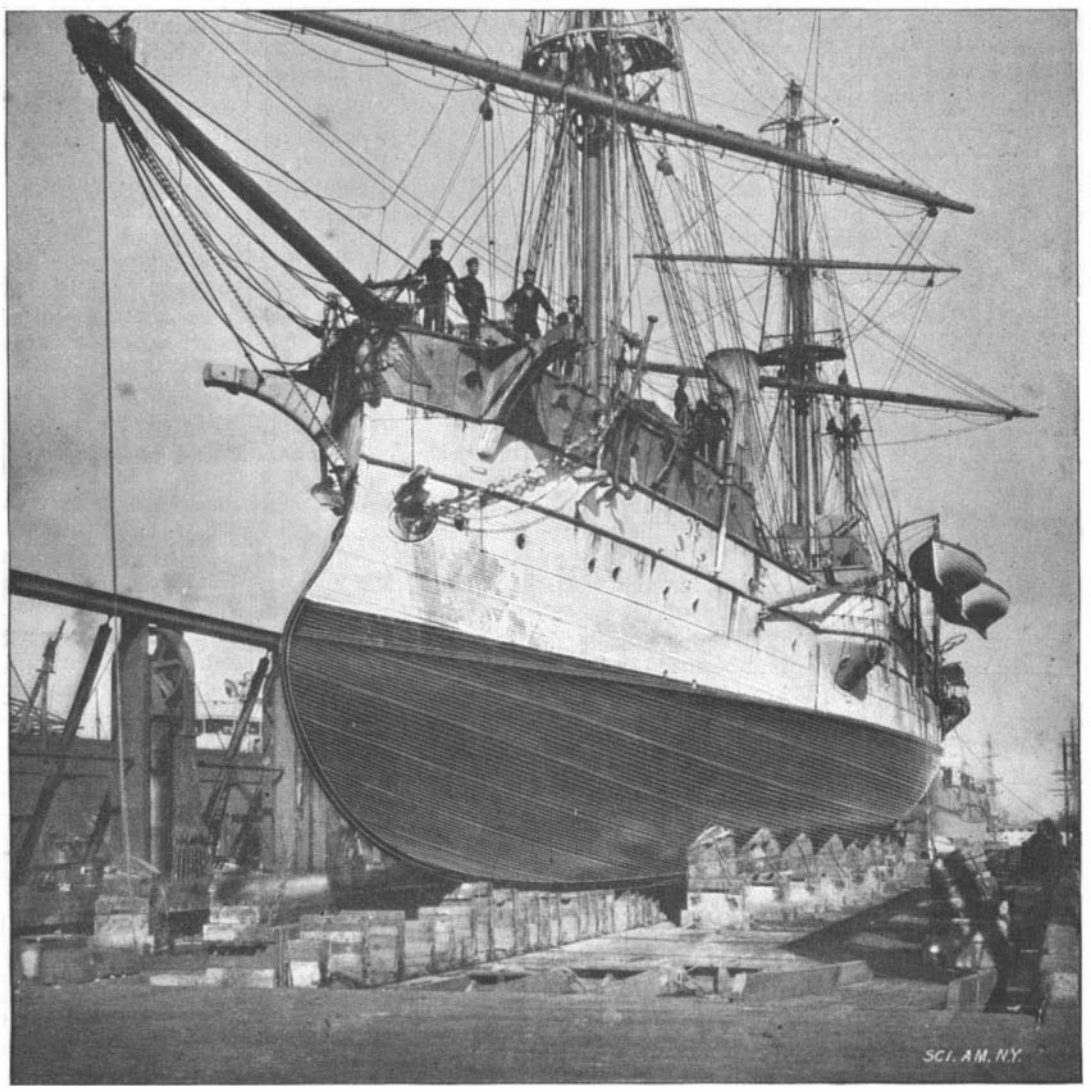
HYDRAULIC LIFT DRY DOCK AT THE UNION IRON WORKS, SAN FRANCISCO.

We present a series of views of a hydraulic lift dry dock, which has many features of novelty. It was designed, built, and erected by the Union Iron Works, for their own use, and forms a conspicuous feature at their fine yard in South San Francisco. The dock was designed with a view to securing: minimum cost of construction; expenditure of power and time in proportion to the vessel to be raised; rapid cleaning and painting of a ship's bottom; convenience in handling heavy weights, such as propellers or propeller blades, which, when the platform is raised level with the wharf, can be run onto the platform on low trucks.

The construction of the platform is simple and unique, consisting of a series of steel girders; one center longitudinal girder having a depth of 6 feet 4 inches, forming the keel, with two girders on each side of the keel, running parallel to it; the two outer girders having a depth of 5 feet. The five longitudinals are tied together by thirty-six transverse girders, having the full depth of the keel at the center, and a depth of 2 feet 10 inches at the ends, the whole being securely riveted together, having heavy angle irons at the corners. Over the whole platform is built a flooring for the men to work upon.



THE ZARAGOZA, FLAGSHIP OF THE MEXICAN NAVY, ON THE UNION IRON WORKS DRY DOCK, SAN FRANCISCO.

Immediately over the center girder or keel are built the keel blocks, with a length of 3 feet. On each of the transverse girders are built the bilge blocks, supported in position against the side of the ship by a pawl engaging a rack. The bilge blocks are placed in their respective positions by ropes in the usual way. The length of the platform on the keel is 436 feet 6 inches and the width is 65 feet 7 inches.

This platform is carried by thirty-six cast iron rams 30·7 inches diameter, having a lift of 14 feet 6 inches, eighteen on each side of the dock.

On the upper end of the ram is carried a sheave 6 feet in diameter, grooved for eight 2 inch diameter steel wire ropes. One end of the ropes is attached to the platform, then passed over the sheave, and the other end is secured to the base castings of the ram, which are stationary. This arrangement gives 2 feet lift of platform to 1 foot lift of ram. There are two piers of piles to support each ram, constructed as follows:

A steel casing 50 inches internal diameter was constructed long enough to have its lower end several feet in

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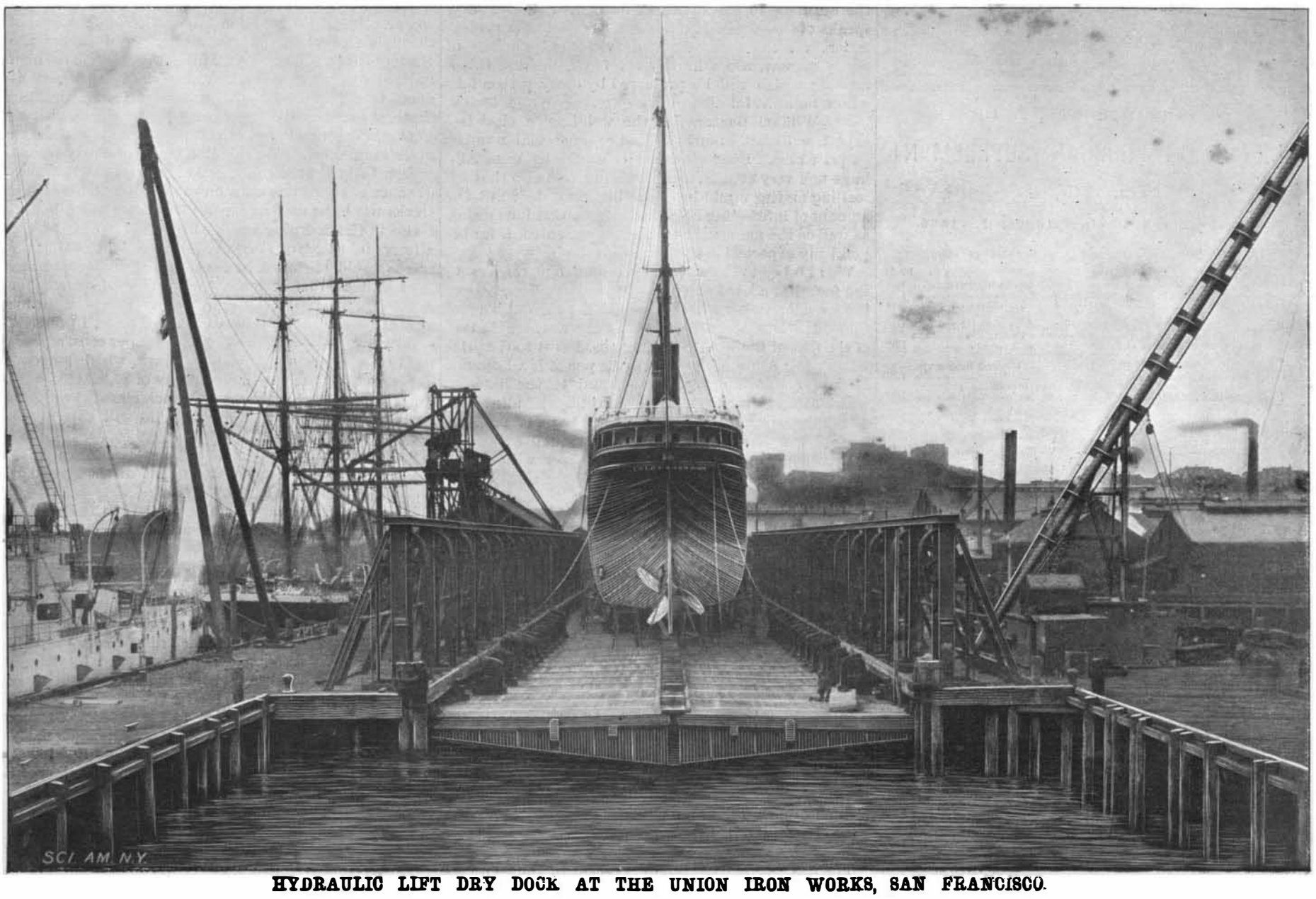

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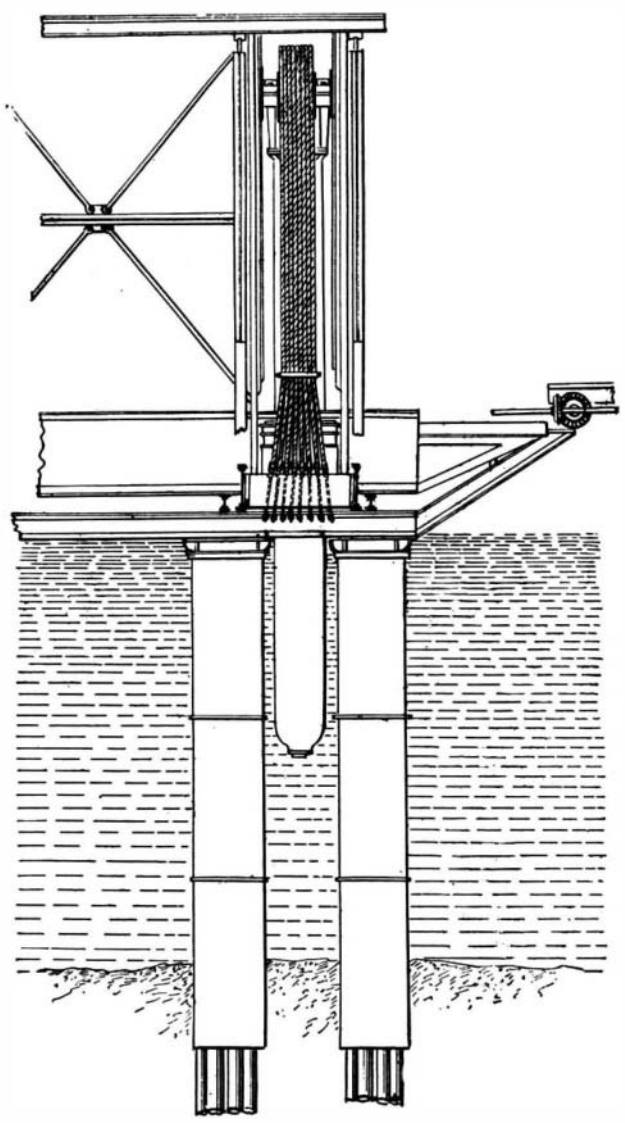
(Continued from first page.)

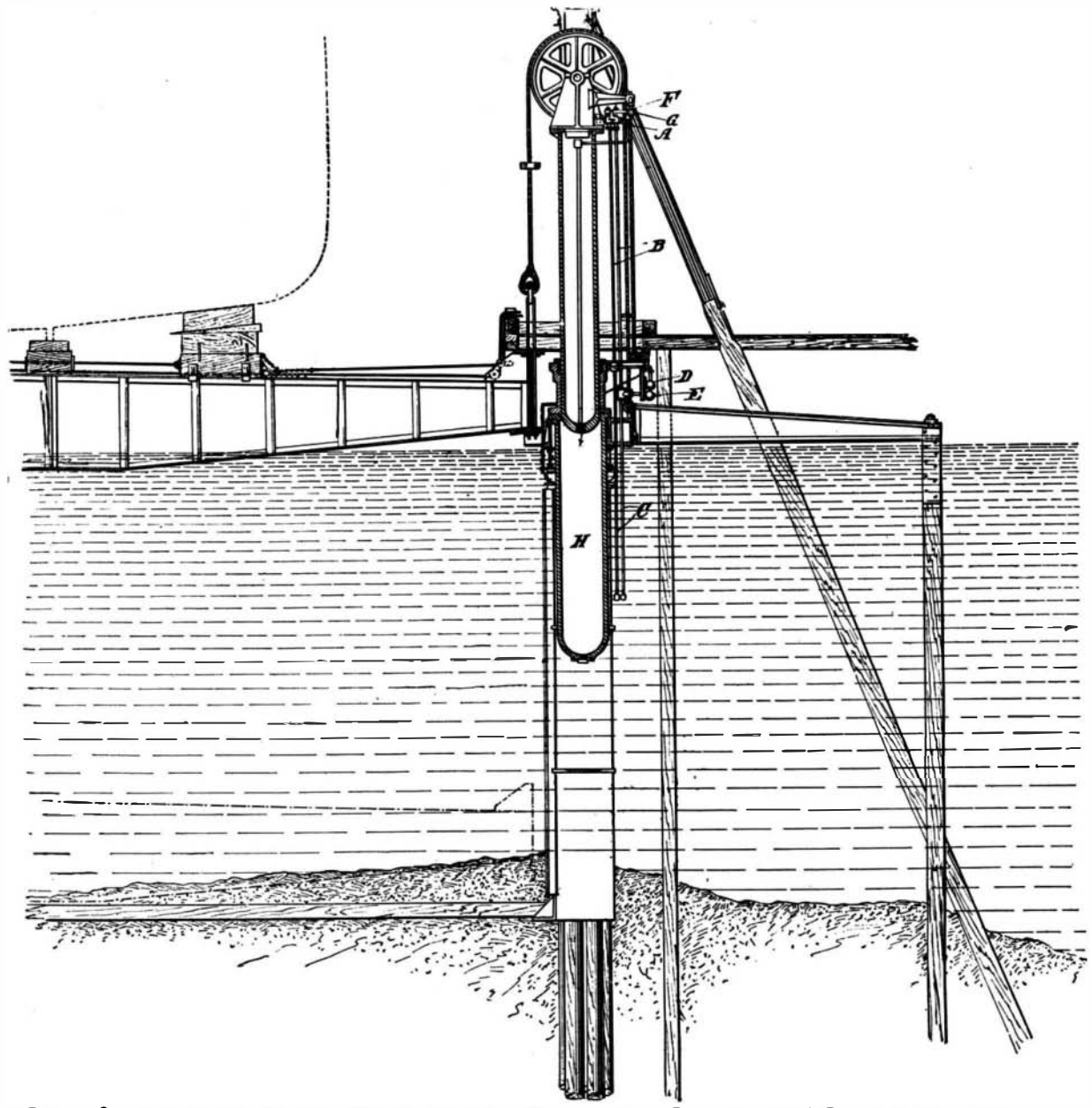
the mud, as shown in end view, with its upper end about water level at mean high tide. This casing was filled with piles 100 feet long, seven to each pier, all leveled off even with top of casing, and the whole capped with a cast iron cap. Each pier is capable of sustaining a weight of eighty-two tons, giving a capacity of 164 tons to each ram.

Running longitudinally and supported on the cast iron caps are two steel girders, with a depth of 18 inches, which directly support the ram cylinders, as will be plainly seen by reference to the end view. To balance the twisting tendency of the transverse girders on the piers, cantilevers were extended out 28 feet from each side of the dock and the ends anchored to two piles for each lever, two levers being used for each ram, or a total of 72 levers.

The equalizing device for the rams is an ingenious affair and exceedingly simple in its operation; each ram being its own governor. The supply pipe, D, for the rams extends along two sides and across one end of the dock, connecting with the accumulator in the pump house. The relief pipe, E, extends over the same course, and discharges back into the supply tank on the roof of the pump house. At the top end of each plunger there is placed a double hydraulic valve, A, with a pipe, B, connected to each one, and telescoping into pipe, C, that extends under water alongside the piers and draws its supply from the main line, D.



UNION IRON WORKS HYDRAULIC DRY DOCK—SIDE VIEW OF LIFTING RAMS AND PIERS.



UNION IRON WORKS HYDRAULIC DRY DOCK—CROSS SECTION, SHOWING CONSTRUCTION OF RAMS AND GIRDERS OF PLATFORM.

At the valve, A, a lever, F, is carried, with its fulcrum equidistant from the center of each valve stem, one being the inlet and the other being the outlet, while the end of the lever engages a nut, G, carried on a vertical screw connecting with a line of shafting surrounding three sides of the dock, and operated by a pair of 6 inches by 6 inches vertical engines placed in the pump house for that purpose alone.

It will be plainly seen, as the nut travels upward on the screw, the lever opens the inner valve and allows the water to flow into the cylinder, thereby raising the plunger until it brings the lever on a level and shutting off its own supply, causing the plunger to follow the nut on the screw. By this means a ship is raised on one end of the platform, with perfect safety, while the other end is unoccupied, all the while the dock being kept on an even keel.

In the pump house, for supplying power to raise the dock, are two 12 inches by 16 inches vertical steam engines, with 90 pounds steam pressure, connected by pinion and gear to four horizontal pressure pumps, 3¾ inches diameter of plungers, 36 inches stroke, running at an average of 31 strokes per minute, and discharging into an accumulator, whose ram is 8 inches diameter by 48 inches stroke with a total weight of 62,000 pounds. From the accumulator the water passes into the rams, under control of the valve mechanism. The accumulator has detachable weights that are added according to the weight of the ship to be balanced in raising, as the operation is simply a case of balance between the ship and accumulator.

The throttle valve of the pump engines is connected to the accumulator, so that whatever leakage takes place in the pipes is constantly kept supplied automatically without any attention.

When the dock is raised a series of locks on each side are run under the platform by hydraulic rams, and the platform is allowed to settle upon them and relieve the ropes and rams from the weight.

The dock has been in successful and constant operation since 1887, and has a record for number of ships docked that is rarely equaled. Considering the novelty and boldness of the design, and the reliable service that it has rendered, this is a piece of engineering which is entitled to the greatest credit.

Some of the principal dimensions are as follows:

Total length of girder	421 feet 7 inches
Total length of platform on keel	436 " 6 "
Width of platform	65 " 7 "
Maximum lift	29 "
Maximum lifting capacity	6,000 tons
" " " per ram	164 "
Number of rams	36
Diameter plungers	30·7 inches
Eight 2 inch diameter steel ropes per ram.	
Two 12 inch by 16 inch vertical steam engines for pumps.	
Four pressure pumps, 36 inch stroke, diameter of plungers, 3¾ inches.	
One Worthington duplex pressure pump, 4½ by 1¾ by 4 inches.	
One accumulator, 8 inch diameter by 48 inch stroke.	
Weight on ram	12,000 lbs.
" of eleven pieces of weights	47,500 "
" of ram	2,500 "
Total weight of accumulator	62,000 "
Average speed of pressure pumps, 31 strokes per minute.	
Pressure of lifting empty dock	275 lbs. per square inch
" " loaded dock	1,250 " " " "
Speed of platform, loaded	3·2 inches per minute, 1,250 lbs. per square inch
Steam pressure	90 lbs. per square inch

VESSELS RAISED ON DRY DOCK OF UNION IRON WORKS.

Year.	Number vessels.	Tonnage.
1887	48	56,634
1888	114	112,167
1889	120	129,828
1890	132	113,738
1891	154	157,082
1892	131	144,544
1893	122	169,343
1894	107	141,587
1895	112	154,414
1896 to May 2	32	43,578
	1,072	1,228,695

This is equal to about 10·1 vessels per month.

Platinotype Effects on Gelatino-chloride Paper.

A correspondent of the Photographic News suggests the following:

A pure platinum black cannot be obtained by using a gold toning solution.

A very near approach to it, however, can be secured by using the ordinary sulphocyanide bath.

Sulphocyanide of ammonia	30 grains.
Gold chloride	2 "
Water	16 ounces.

When toning, examine the prints from time to time by holding them up to the light and looking through them.

Toning is complete when the warm tones have disappeared, except from the darkest portions of the print, which should appear of a deep chocolate brown.

At this point transfer the prints to a dish of clean water and wash for a few minutes.

On placing in the fixing solution the prints will turn slightly warmer in tone, but will become darker when finished and dried. When the prints have been fixed and thoroughly washed they are ready for finishing.

Take a piece of finely ground glass such as is used for focusing screens. Wash well with soap and water, wipe perfectly dry, and rub lightly with a soft cloth and powdered talc.

Dust off the superfluous talc; wipe the edges and back of glass clean. Place the glass in a dish and cover with water.

Take up a print and wash the surface with a small sponge, using plenty of water. This is to free the surface from any particles of grit or dirt which may be adhering to it.

Float the print on to the ground glass under water, taking care to avoid air bubbles.

Withdraw from the water, place a pad of blotting paper over the print, and squeegee it into contact with the glass.

A perfect matt surface can be obtained in this way. More detail is shown than if ready-made matt surface paper is used, and the result is very artistic.

SOME one in Germany, according to a recent account, proposes to build a house of which the framework is to be made up of water tubing, through which warm water is to be circulated in winter and cold water in summer, warming or cooling the inclosed spaces as may be prompted by the requirements. All the floors and ceilings and walls are to be crossed and recrossed with water pipes, affording heating and cooling surface exactly where theory tells us it should be to give the most desirable results. The building of that house would certainly afford an excellent, modern, practical demonstration of the value of these ideal principles.