RECONSTRUCTION IN CONCRETE OF DRY DOCK No. 2, NEW YORK NAVY YARD.

The reconstruction of Dry Dock No. 2 of the New York navy yard, Brooklyn, affords a striking object lesson as to the defects of wood and the advantages of masonry in this kind of structure. The choice of timber in dry dock construction was determined entirely by considerations of cheap first cost; for not even the most sanguine advocate of wooden dry docks has suggested that they would compare in economy of maintenance and repairs with the stone docks.

Dry dock No. 2 was built in 1890, and after a useful life of only nine years, it has failed so completely as to render its entire reconstruction desirable. Compare this with the record of the adjoining dry dock No. 1, a granite structure, which is just as good to-day as when it was opened over half a century ago.

On more than one occasion we have described the constructive features of wooden dry docks, and the reader is referred to the illustrated article in our issue of February 20, 1897, describing the big dry dock officially known as No. 3.

Apart from the serious objections to wooden dry docks on the score of their rapid decay and the need of constant renewal, either in part or in whole, their construction is such that they are but poorly adapted to withstand the heavy hydrostatic pressure to which they are subjected when dry. The floor and walls of the wooden dry dock are nothing more than a comparatively thin shell of wood, bolted down upon a mass of piling which has been driven over the whole area of the dock; and while they are fully able to withstand the outward pressure due to the weight of a ship when the dock is empty, or of water when it is full, they are entirely unsuited to withstand the inward thrust of water which may get in behind the altars and beneath the floor when the dock is pumped dry. In the case of a large dock 30 feet in depth, the hydrostatic pressure tending to burst in the floor and lower walls will approximate one ton to the square foot. Such a disaster is guarded against by driving several walls of sheet-piling entirely around the dock; but it frequently happens that carelessness in driving the piles, or the presence of obstructions underground, will cause a break in the continuity of the sheet-piling, and permit the accumulation of water behind the altars.

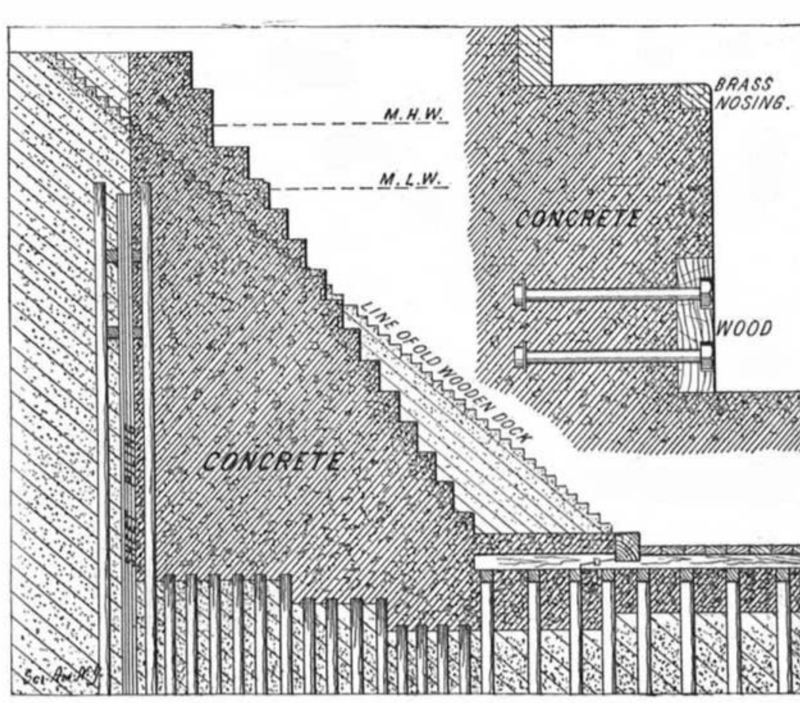
In the case of the dock now under consideration, it seems that during a heavy and prolonged rain storm last year, the culverts proving insufficient to carry off the storm water, it flowed over the surface of the navy yard and collected behind the walls of the dock, which proved unequal to the strain upon them, and bulged out at the point shown in one of our first page illustrations, to the extent of several feet, breaking off the 12 × 12 caps, and generally wrecking the structure over a considerable portion of its area. It was decided that the most satisfactory way to repair the damage would be to reconstruct the walls of the dock in concrete.

In carrying out the repairs, the steps, or "altars," as they are called, were first stripped to the level of the lower guide-wales of the sheet-piling, as shown in the lower engraving of our first page, and the backing was excavated to the same level. The wall of sheet-piling was then driven, the piles penetrating to a depth of 54 feet from the ground level. The stripping off of the timber structure and the excavation of the backing was then carried down until it was possible to put in position the shoring timbers, which will be noticed extending from the longitudinal wales to the old sill or bottom altar at the floor of the dock. The excavation was then carried down to the floor level and round piles were driven over the whole surface, the distance from center to center of the piling being 2 feet. The piles were then cut off about 6 inches above the ground, as shown in the accompanying transverse section of the dock. On this foundation, as thus formed, was built up the concrete monolith, its outer face abutting against the wall of the sheet-piling and its inner face being stepped into altars. It was originally intended to build the altars of granite; but to avoid the delay that would be caused by waiting for the delivery of the granite, it was decided to build them of concrete. To protect the altars, 1½ by 2¼-inch brass nosing-strips were laid along their edges, and 3 by 12-inch pine fender-strips were let into the risers, as shown in the accompanying drawing.

It will be noticed that the slope of the side walls of the concrete dock is considerably steeper than that of the old structure, the two being in the ratio respectively of 2 to 3 and about 1 to 1. The result is that the new dock has a form which is very much better adapted to the docking of ships, inasmuch as it gives more room (22 feet on the floor) where it is greatly needed, and brings the upper edges of the dock closer to the sides of the ship—advantages which greatly facilitate the handling of material and the general operations connected with dry dock repairs. The old floor of the dock was left undisturbed between the side sills, but the transverse timbers were extended beneath the concrete for the full width of the new floor, in order to give increased transverse strength to withstand the upward thrust due to hydrostatic pressure.

The concrete monolith will be extended entirely around the dock to the inner of the two grooves provided for receiving the caisson gate. Here the timber groove will be replaced by one in granite. It is fortunate for these repairs that the dock was designed with outer and inner grooves, since by placing the caisson at the outer groove and shoring it from the floor of the dock, as shown in one of our first page illustrations, it was possible to build the new granite groove without any further preparation. Had it not been for this circumstance, it would be necessary to build a heavy coffer-dam across the entrance channel, whose cost would have added greatly to the total cost of the reconstruction. Advantage has been taken of the opportunity offered by the construction of the new groove to build a new caisson and enlarge the entrance to the dock, the enlarged caisson affording an entrance 72 feet wide on the bottom as against 53 feet, while a gain in width of 5 feet has been made at the coping, and a gain of 6 inches in the depth over the sill. The result of these changes is that the reconstructed dock will be capable of accommodating any ship in the United States navy.

When it is stated that the cost of these repairs will be about $600,000, it might seem that the advantages which we have outlined above were purchased at a rather dear figure; but when we consider the relative cost for repairs of masonry and timber docks already in existence in the United States navy, it will be realized that the more durable structures are, in the long run, the more economical. The figures furnished by the Bureau of Yards and Docks show that during the seven years from 1892 to 1899, the repairs on the three stone docks at Boston, New York and Norfolk amounted to only $4,543, whereas the repairs on the three timber docks at New York, League Island and Norfolk amounted during the same period to no less than $426,073. The reconstruction of the dock has been carried out under Capt. P. C. Asserson, C.E., to whom we are indebted for courtesies extended in the preparation of this article.



Cross-Section Through Side Wall of Old and New Dock, and Detail of Altar Protection.

NEW CONCRETE DOCK, BROOKLYN NAVY YARD.

A New Use for Fogged Plates.

Dry plates that have been fogged before exposure in the camera by some means or other, can be utilized for the production of transparencies. Take the fogged plate and expose it to lamplight for a few minutes, in order that it may be fogged evenly all over. Then immerse it in the following solution:

Copper chloride	350 grains.
Potassium bromide	42 "
Water	16 ounces.

The plate should be left in this bath for about ten minutes, and then thoroughly washed in water. The whole of the operations may be performed in orange light. When dry the plates are comparatively insensitive. To print, the plate is placed behind the negative in the printing frame in the usual manner, and with a negative of average density an exposure of from twenty to thirty seconds may be given in diffused daylight; or from two to five minutes at a distance of about twelve inches from an ordinary lamp or gas burner. Any developer may be used, but care should be exercised to use rather a large proportion of bromide.

Correspondence.

The Color Screen for Astronomical Telescopes.

To the Editor of the SCIENTIFIC AMERICAN:

The article on the subject of the color screen in the issue of the SCIENTIFIC AMERICAN of September 22 contains some statements which are not in accord with the historical facts in regard to its development, and some conclusions in regard to the results which are premature, if not erroneous. I am glad, in the interests of scientific and historical accuracy, which the SCIENTIFIC AMERICAN always aims to serve, to give fuller information in regard to the facts of the case. The color screen for the purpose described can hardly be called an invention, but an application to visual telescopes of a device well known in photography, but used for a somewhat different effect. Its use on the 26-inch equatorial of the Naval Observatory was the result of successful experiments made by Prof. See and Mr. Peters to remove the violet-blue halo caused by the secondary spectrum, which is a source of annoyance in all large achromatic refractors. While its use for this purpose is effective, it ought not to be inferred that it causes a decided improvement in bad definition of the image due to atmospheric condition. It would also be premature to assert that the experiments show such decided effect in the reduction of the diameters as are indicated in the article in question, until further measurements shall have been made by other observers both with and without the color screen, in order to remove the probability of systematic personal error to which all observations of this kind are peculiarly subject.

At the time of the publication in the Astronomische Nachrichten, in April, 1900, of the description of the color screen and the preliminary results obtained by its use on the great equatorial of the Naval Observatory, it was thought that the matter was entirely new. The editor of that journal, however, in an editorial foot-note, called attention to a previous successful investigation of the same character as follows:

"Concerning earlier successful attempts to eliminate the secondary spectrum, compare M. Mittenzwey, Astronomische Nachrichten, 2523 and 2524, 'On the Absorption of the Secondary Spectrum in Large Refractors.'"

These earlier investigations do not appear to have been generally known, and the use of the color screen does not appear to have been carried beyond the experimental stage or practically tested by use on an instrument of large dimensions. A reference to Mittenzwey's communication on this subject in the Astronomische Nachrichten, 1883, shows, however, that he fully appreciated its advantages, as will be seen by the following brief quotation:

"A thorough spectroscopic investigation of the absorption of a large number of colored media has finally resulted in an extremely simple method, by which the secondary spectrum in the achromatic telescope is so far removed as to be imperceptible in an instrument of 6 inches aperture and 60 inches focal length with 400 magnifying power, while the brightest colors of the spectrum suffer thereby no perceptible diminution in intensity. The image of a bright star is shown . . . as a little disk surrounded by a few diffraction rays, yet completely free from the strong violet-blue halo which in instruments of large dimensions forms such an objectionable feature. Upon the disks of planets, details of delicate markings are rendered distinct which otherwise are seen only with difficulty.

"The contrivance consists of a capillary fluid cell of blue-green fluorescent derivative of resorcin, fluorescein, which is inserted in the cone of rays close to the ocular system.

"A very weak alkaline solution of the same in glycerin, which will not dry up, was inclosed in a capillary cell of two plane parallel glass plates, and this cell in turn was fastened onto the plane surface of the field lens by a film of oil, or else to the cap of the eyepiece."

By giving the above statement due publicity you will greatly oblige S. J. BROWN,
Prof. of Mathematics, U. S. N. Astronomical Director.
Washington, D. C., October 9, 1900.

AT Altoona, Pa., the Edison Electric Illuminating Company strings its wires with the aid of an electric motor, which is carried by a truck. The current for the motor is obtained by tapping the company's three-wire system. The motor drives an ordinary stonemason's crab. The speed is reduced by a countershaft, which gives a rate of rope travel of 40 feet per minute. A ¾-inch rope is used and a small four-jaw home-made clutch, to which the wire is fastened. The wiremen have no difficulty in pulling up 3,000 feet of large bare copper wire a day on street work, says The Electrical World.

SCIENTIFIC AMERICAN

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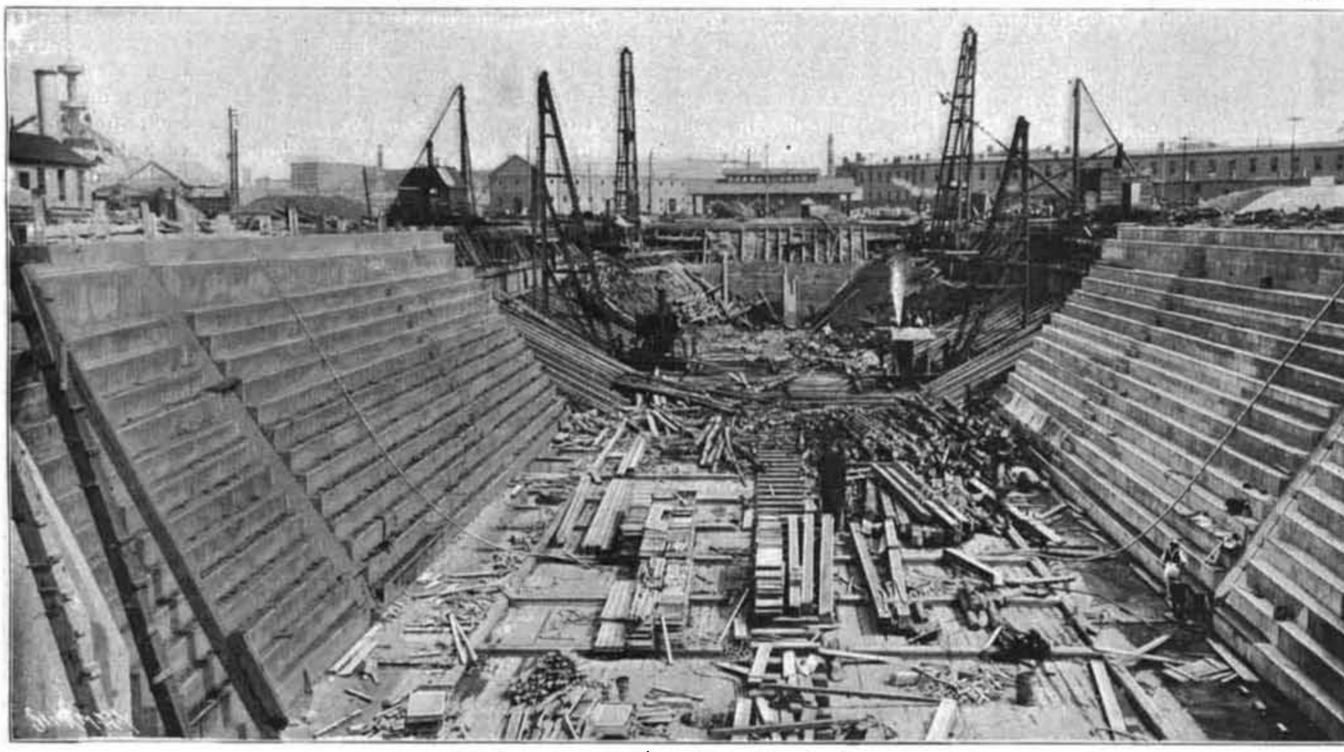
A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

Vol. LXXXIII.—No. 16.] ESTABLISHED 1845. | NEW YORK, OCTOBER 20, 1900. | [$3.00 A YEAR. 8 CENTS A COPY.



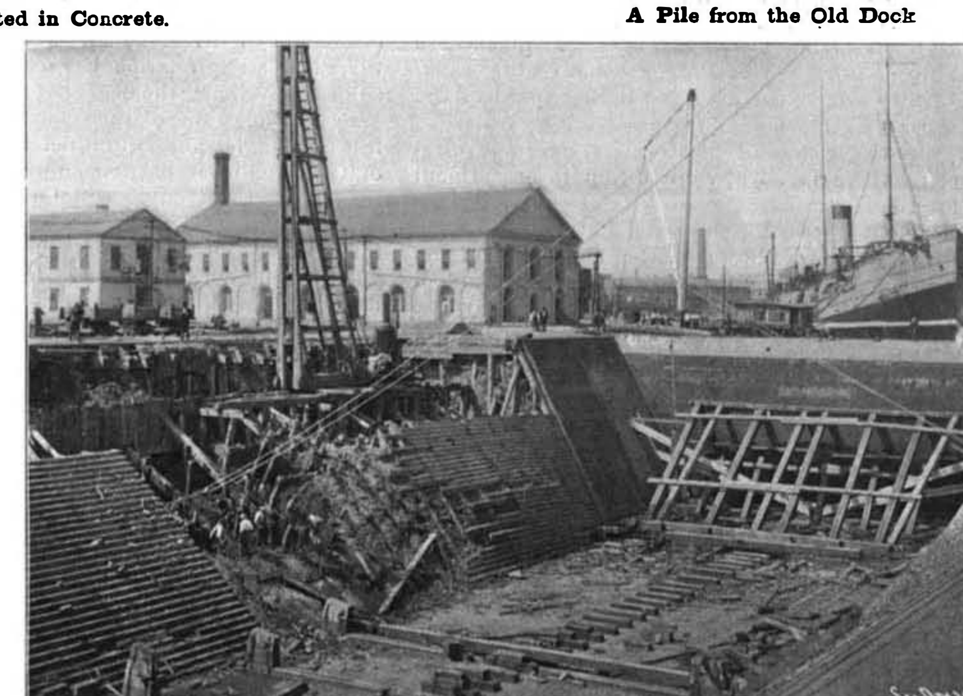
Width of floor of old dock, 50 feet; of new dock, [illegible] feet.

View Showing One-half of Dock Reconstructed in Concrete.

Result of striking an obstruction.

A Pile from the Old Dock

Pile Foundation for Concrete Monolith.



Spot at which Side of Dock was Burst In.

View Showing Portion of Old Wooden Dock and the Excavation for New Concrete Structure.

FROM WOOD TO CONCRETE—REPAIRS TO DRY DOCK No. 2, BROOKLYN NAVY YARD.—[See page 246.]