HYDRAULIC CAISSON SINKING FOR FOUNDATION PIERS.

Engineers will be interested in the method adopted in sinking caissons or cylinders through strata of earth to bed rock, for foundations of any superstructure, which we illustrate herewith, although the principle is not new. Piles have repeatedly been sunk in a similar way, that is, by forcing down to the bottom of the hollow pile a stream of water of sufficient quantity and force to wash out a cavity into which the pile may drop. Mr. William D'H. Washington, of this city, has applied this principle to sinking larger cylinders; and in the preparation of the foundations for a 16 story building at Broad Street and Exchange Place he has shown that it may be successfully done.

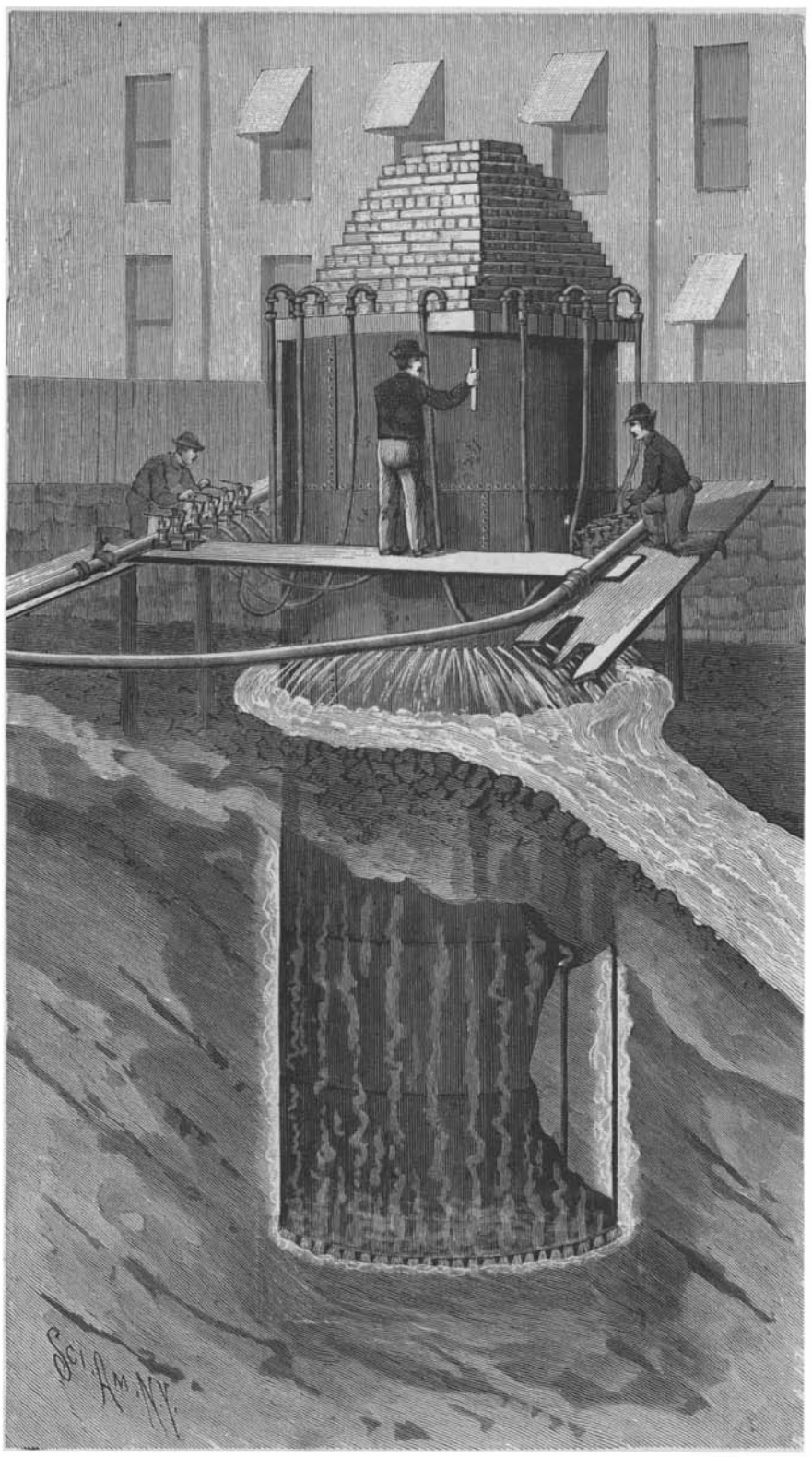
The character of the ground necessarily enters largely into the successful use of the agency of water in sinking either piles or cylinders. At this point the ground was generally stiff, but quicksands were liable to be met with. The building for which these cylindrical piles are used to facilitate putting down foundations will weigh about 30,000 tons and occupy a plot of land 88 by 150 feet. The bed rock, to which the cylinders are being sunk, is 42 feet below the sidewalk, and 44 of these cylinders are employed, from 6 to 13 feet in diameter each, and about 27 feet long—the length required to reach bed rock from the cellar of the old building occupying the site.

The operation consists in sinking open steel cylinders by the use of water jets issuing from hollow castings bolted to the bottom edge of the cylinders, the lower edges of the castings being sharp. The water is forced down to the jet openings through pipes on the inner edge of the cylinder, the outer ends of the pipes being connected by flexible tubes to valves in the main supply pipe from the pump. The cylinder shown in our illustration was 10 feet in diameter, and as it sank additional segments were added until, at about 28 feet, the lower edge rested upon the bed rock.

As will be seen in our view, the top of the cylinder is weighted, about 30 tons having been placed there to assist in the sinking. As the ground at the bottom edge of the cylinder is softened and partially washed out, a current is established to the surface by the outer and inner surfaces of the cylinder, thus lubricating both surfaces as it were, and the cylinder readily drops into the soft ooze.

The cylinder is kept in a plumb position by closing the water valves in the pipes leading to the lowest edge and allowing the flow to the higher edge to continue until the cylinder cuts its way and settles to a true vertical position, levels being constantly applied during the sinking. Obstacles like timbers have to be cut away, but bowlders may be generally got rid of by driving a small pipe down to the obstacle and washing out a cavity by its side, into which it is forced by the edge of the cylinder. The rapidity with which these cylinders have been put down is remarkable, one cylinder having been sunk 26 feet 6 inches in one and a half hours, and on another occasion when soft quicksand was encountered a record of 10 feet in five minutes was made. The water pressure in the pipes varies, according to the depth, from 25 to 150 pounds.

The core of the cylinder is subsequently removed by digging in the ordinary way, and the cylinder filled with the usual concrete base and brick masonry.



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FROM the action of sulphuric acid on the gas from cleveite, M. Deslandres has obtained in the extreme red of the spectrum the third of the four lines in the solar spectrum that had not been found on the earth. This leaves only one permanent ray from the solar atmosphere, the green line, known as "the line of the crown," yet to be discovered in earthly substances. It probably belongs to some gas lighter than hydrogen.

IMPORTERS of sewing needles made in Germany are able to sell them in this market on a profit at fifteen cents per one thousand needles. This is for the common quality. The better qualities sell for from forty to sixty cents per thousand. At present there is no duty on needles.

Coal Deposits of Kachemak Bay, Alaska.

The arrival at this port of the American bark Theobald, with a cargo of coal from Alaska, renews interest in Kachemak Bay, Cook's Inlet, in the northernmost part of that territory. This coal indicates its probable importance. Like all coals on this coast, it has a considerable percentage of water, which, while against it for coking, is in its favor for other purposes. Tests, some of which were extended over a period of several months, of the coal have demonstrated that it burns clean, is remarkably free from soot and smoke, and has good heating qualities; and while with a strong draught it will burn rapidly, yet with a light draught it will make a strong and hot fire lasting for a considerable time. From all information obtainable, it seems not unlikely that this coal may aid in solving the problem of cheap fuel supply for use in manufactures, steam vessels and some domestic purposes.

These coal deposits embrace a territory of 300 square miles. They underlie that portion of the peninsula between Kachemak Bay and Cook's Inlet. How much of this is practically available has not as yet been determined, but surveys and examination have shown the existence of large quantities. Eighteen veins have been examined, which vary in thickness from a few inches to five and six feet. The coal in these veins differs in quality, some being of sufficient thickness and character to warrant profitable working. As the entire geological formation of the coal deposits belongs to the Miocene period, they are of a lignitic character, some being very frail, decomposing or crumbling on exposure to the atmosphere, while others are strong and highly carbonated and will stand shipment as well as any coast coal. Owing to their peculiar local conformation (dipping into the mountain at a decline of not more than two feet to the mile), they can be mined at a comparatively small cost, no shaft work or heavy pumping being required, obviating the need of an expensive plant to be maintained. Mr. George R. Tuttle, who has spent many years in coal and gold mining, made a personal visit to these coal deposits in Alaska. He says this coal is desirable for grate and all kinds of domestic use, for which it takes rank alongside of Scotch splint, while for manufacturing and general economic purposes these coals will be found among the best varieties brought to this market. Very little of the "Alaska splint" coal has been brought to San Francisco, and that was taken from the outcropping of the vein, where it had become air-slaked and devitalized by exposure to the elements. It is thought that when the present company—the North Pacific Mining and Transportation Company—shall have extended its mining operations farther into the formation, the quality of the coal produced will be still more desirable. While the distance to the coal fields is relatively much farther in miles than to our present base of supplies in Washington and also in British Columbia, yet the lesser expenses for mining, putting on vessels, and the absence of river tolls, harbor dues, towing, piloting, etc., will enable the coal to be brought from Alaska at sufficiently low cost to warrant entering into competition for the demand of San Francisco and the California coast, and will yield to the owners a fair net profit.

The annual report of the Geological Survey is to hand; speaking of the production of coal in California during the past year, the report says:

"The total product in 1894 was 67,247 short tons, of a spot value of $155,620. The decreasing tendency of coal production in California noted in a preceding volume of the mineral resources continued in 1894. The largest product in any one year was obtained in 1889, when it reached 121,820 short tons. In only one other year did it exceed 100,000 tons. This was in 1890.

"California coals are of inferior quality, mostly lignite and high in moisture or ash, or both. They can, however, and do, to some extent, act as a balancing wheel in keeping prices for other coal at a reasonable figure. Consumers are willing to pay higher prices for better coal, but there is a limit beyond which it is found impolitic to go, and California lignites would be found cheaper fuel, notwithstanding their inferiority."

This fact should be borne in mind by consumers in San Francisco, and encouragement should be given to the development of such mines as the State has. As it is, prices for coal in San Francisco have materially declined in the past few years. In 1890, English coal was selling at from $10 to $13 per ton. At the close of 1894 it was much cheaper. Such cheapening of fuel is of great benefit to manufacturers.

It is true that the decline in value was originally due to heavy importations, chiefly in 1891, when the total receipts exceeded those of the previous years by nearly half a million tons and resulted in a glutted market, but unless there should be other resources for consumers to fall back upon, the present low rate will not be apt to continue. The statistics for 1894 are as follows: Contra Costa County, total production, 39,200 short tons; Amador, Fresno and San Diego, 28,047 short tons, making a total for the State of 67,247 tons, valued at $155,620. In 1893 the total production was 72,603 tons and the total value $167,555.—Min. and Sci. Press.

Waterproof Varnish.

This formula for varnish is well adapted for the protection of prints on glass against humidity; moreover, it keeps well. Here is the mode of preparation:

White gum lac	27 to 32 parts.
Borax	8 "
Carbonate of soda	2 "
Glycerine	1 to 2 "
Water	320 "

Dissolve the borax and the carbonate in 160 parts of warm water, and place in the solution the gum lac, which has been broken into small fragments. Place on the fire the vessel containing the mixture, and agitate until the lac is dissolved. Allow to cool, filter, and afterward add the glycerine and the quantity of water necessary to complete the 320 parts. At the end of a few hours a deposit is formed; after filtration the liquid should have an amber-yellow color.—L'Amateur Photographe.