nice balance must be maintained in order to control the rapidity with which the concrete leaves the pipe.

Of course, a tremie should always be plugged when first charged; otherwise a layer of separated stone, sand and cement mixed with laitance will be deposited in the bottom of the forms, or a seam of such material made in the structure.

The bottom-dump bucket method possesses the disadvantage of permitting at least a slight settlement of the concrete through water and the precipitation of a small amount of magnesia on the surface of each batch. This will cause some laitance to permeate the mass, and may also cause some segregation. As with the tremie, successful results can be obtained only by the exercise of extreme care.

If the work below the low-water line is carried on intermittently trouble may occur unless particular precautions are observed thoroughly to clean the surface of the concrete previously deposited before the placing of concrete is resumed.

Construction Seams Must Be Prevented

For the work above the low-water line every precaution should be taken to prevent the formation of construction seams of laitance. If the tide rises and covers the section before completion of the work the surface of the concrete should be thoroughly cleaned by scrubbing with a stiff broom and washing with a hose before resumption of concreting.

The simplest way to prevent disintegration at construction seams is to not have any such seams. If the work is done in short sections bulkheaded between the forms the concrete can be brought up faster than the tide rises.

BREAKS IN WATER MAINS*

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BREAKS in water mains, their causes, and means of preventing same, is a subject which is growing in interest to waterworks officials, especially officials responsible for the supplies to thickly populated districts. The fact that it is always unknown when one of these breaks will occur is acknowledged by all engineers and superintendents having responsible charge of the water supplies as the most trying part of the maintenance of the waterworks system.

The purpose of this paper is to give an account of the breaks which have occurred in connection with the supply of water to Boston, Mass., and the surrounding towns, known as the Metropolitan Water District, since the works were put in operation, January 1, 1898.

The area of the Metropolitan Water District is 174.8 square miles, and the population as supplied, July 1st, 1916, is estimated as 1,190,220.

Water is distributed to the several cities and towns through 122.22 miles of pipes from 60 ins. to 10 ins. in diameter. Connected with these mains there are 516 valves for controlling the flow of the water, and 59 Venturi meters of sizes varying from 6 ins. to 48 ins., by means of which a continuous record is kept of the quantity of water used in each of the eighteen municipalities supplied with water.

*Abstract of paper read before the New England Water Works Association.

With the exception of a 30-in. wrought-iron cement-lined pipe line, 11,200 ft. long, a 10-in. calomine pipe line 3,140 ft. long, and a few short lengths of steel pipe, all the distributing pipes belonging to the Metropolitan Works are made of cast iron.

The distribution system in the several cities and towns which are supplied with water from the Metropolitan works contain 1,732.85 miles of pipe, 176,236 services, and 16,928 fire hydrants.

Every precaution was taken in the construction of the works to see that the pipes were properly inspected as to quality of material, workmanship, and coating at the foundry. The pipes were again inspected as they were delivered at the various pipe yards for imperfections and cracks. The pipe lines were laid under the direction of engineers and inspectors especially qualified for this work. Instructions were given to see that the trench was properly excavated, especially in a rock cut, where there is great danger of breaks occurring if all projecting points of the rock are not removed to a sufficient depth to allow a slight settlement of the pipe after it has been laid.

Of the twenty-five breaks that have occurred on the Metropolitan Waterworks system since January 1st, 1898, seven have been on pipes of existing works that were taken as part of the system.. Thirteen of these breaks were due to settlement of the pipe on to a rigid support which supported the pipe at only one point. Five breaks were due to cracked pipe, two to blasting, one to a water hammer caused by a pressure regulator, one to a spud of a dredge being dropped on to the pipe, one to a dredge pulling a pipe apart, one to a blow-out in a cement line, and one, cause unknown.

Examination shows that thirteen of the breaks have been probably due to a slight settlement of the cast-iron pipe on to something solid, which emphasizes the fact that it is necessary to see that the rock is excavated to a sufficient depth to allow a slight settlement of the pipe after it has been laid. It also emphasizes the fact that great care must be taken in maintaining a line to prevent other structures being erected under the main so that there will be sufficient clearance to allow a slight settlement. The writer has always found public service corporations willing to use due care when the situation was fully explained to them, but has always insisted that all work, where any structure was to pass under the Metropolitan mains, should be inspected while the work was in progress.

The Canadian Monthly Building Review says: "New building holds up well in eastern Canada. During the first nine months of 1917 the returns from 19 cities in Ontario increased $571,827 over the corresponding period last year. In Quebec the gain in five cities totalled $464,597, and in three cities in the Maritime Provinces $124,580."

The reconstruction of the Yokohama pier, which has been in progress for the past six years, has been completed. The pier is now 1,200 ft. long and 138 ft. wide, and the depth, alongside, which was formerly only 26 ft. at low water spring tides, has been increased to 35 ft., providing adequate accommodation for the largest steamers engaged in the Pacific passenger trade. Two large double-storied sheds have been provided.

Chrome ore or chromite production in the United States in 1916 exceeded all previous records. More than 47,000 tons was mined and sold, against only 255 tons in 1915, according to the United States Geological Survey. In the Pacific Coast states, particularly California, the increased output has been remarkable. In Oregon the production was more than 3,000 tons last year, while in California it was nearly 44,000 tons. It is evident that for some time to come California will furnish the chief domestic supply with the output from some deposits expected to exceed this year that of 1916.