

## CHAPTER VIII.

## NOTES ON THE CONSTRUCTION OF ABOUT TWO MILES OF 16-INCH WATER-MAIN.

THESE notes are offered because the writer's experience has led him to believe that detailed statements of cost and of methods are not overabundant, and that a modest contribution to this department of engineering literature, even if it border on the commonplace, will not be unwelcome.

The city of Taunton, Mass., is supplied by direct pumping, and there is no store of water for any emergency. The pumping-machinery is in two portions, and under any ordinary conditions either portion is competent to maintain the supply, but we cannot, of course, be content with provision for nothing but ordinary conditions.

For that district of the city which is more distant from the pumping-station and higher than the City Square, the distributing portion of the system has been for some time inadequate, and, moreover, the small pipes have made it impossible for the city to receive from a powerful pumping plant belonging to a manufacturing establishment in that district the aid which might be rendered should the public pumping-machinery become disabled. The need for a new and larger main arising

from the foregoing conditions was easily made evident to the proper authorities, and its construction was ordered.

The line was surveyed by the writer with one assistant in April, 1887, and the accompanying illustration shows the main in plan and profile, with its immediate connections.

The pipe began to arrive in May, and was carted on low two-horse trucks for 64 cents per gross ton, over good roads, for an average distance of about  $1\frac{1}{2}$  miles.

Referring to the plan, the work from A to B was without special features or difficulties. With the exception of a short stretch of quicksand and water at and near the first turn north of A, the digging was good and the trench required no bracing. The distance from A to B is 2,927 feet, and the cost of labor for this section was 32.3 cents per lineal foot. This includes all labor charged on the time-book, from the foreman to the water-boy in a gang of about sixty men.

From the point B to the end of the line at E, an 8-inch main was removed and a temporary supply maintained, so that no consumer on the line was without water for more than an hour or two at any one time. That the sections requiring temporary supply might be as small as possible, two gaps in the distributing system were closed; the first one on Broadway north and south of Jefferson Street, between points F and G; and the second between the dead ends on Pleadwell Street and on Fourth Avenue, which were brought to a junction, as shown on the plan. The first connection gave Jefferson, Madison, and Monroe Streets a continuous supply while Bay Street was cut off, and the second made possible a temporary surface connection, indicated by the dotted line, from Fourth



Avenue to Third and Fifth Avenues, which came in use when Whittenton Street was cut out.

It is to be understood, of course, that Washington Street continues in a northerly direction (see plan), and by cross lines completes a circuit for Whittenton, Bay, and adjoining streets.

The profile makes the proper positions for the blow-offs self-evident, and they are all six inches in size. The only portion of the pipe that cannot be drained by the blow-offs is found on Whittenton Street a few feet east of the line of the Old Colony Railroad, where a short trap exists, because of our unwillingness to disturb and wholly relay a first-class 10-inch drain which had been put in by the street department.

While this departure from the grade destroys the perfect drainage at which we had aimed, it will probably in actual practice be found to be of no real importance.

The position of the main 16-inch gates is shown on both plan and profile; they are of the ordinary upright bell-end Chapman pattern, not geared, with the exception of the one on Bay Street, near Maple Avenue, where the shallow trench obliged us to use a geared gate lying on its side.

At two or three points the stems of the upright gates came so near the street surface that the only box which could be used was Morgan's A A A extension valve-box, or one of like pattern.

The method followed in maintaining the temporary supply was adopted after careful consideration of three alternative methods; it is not new, for since this work was finished we learn that it is essentially the same as that followed by Mr. Coggeshall in a similar case in New Bedford.

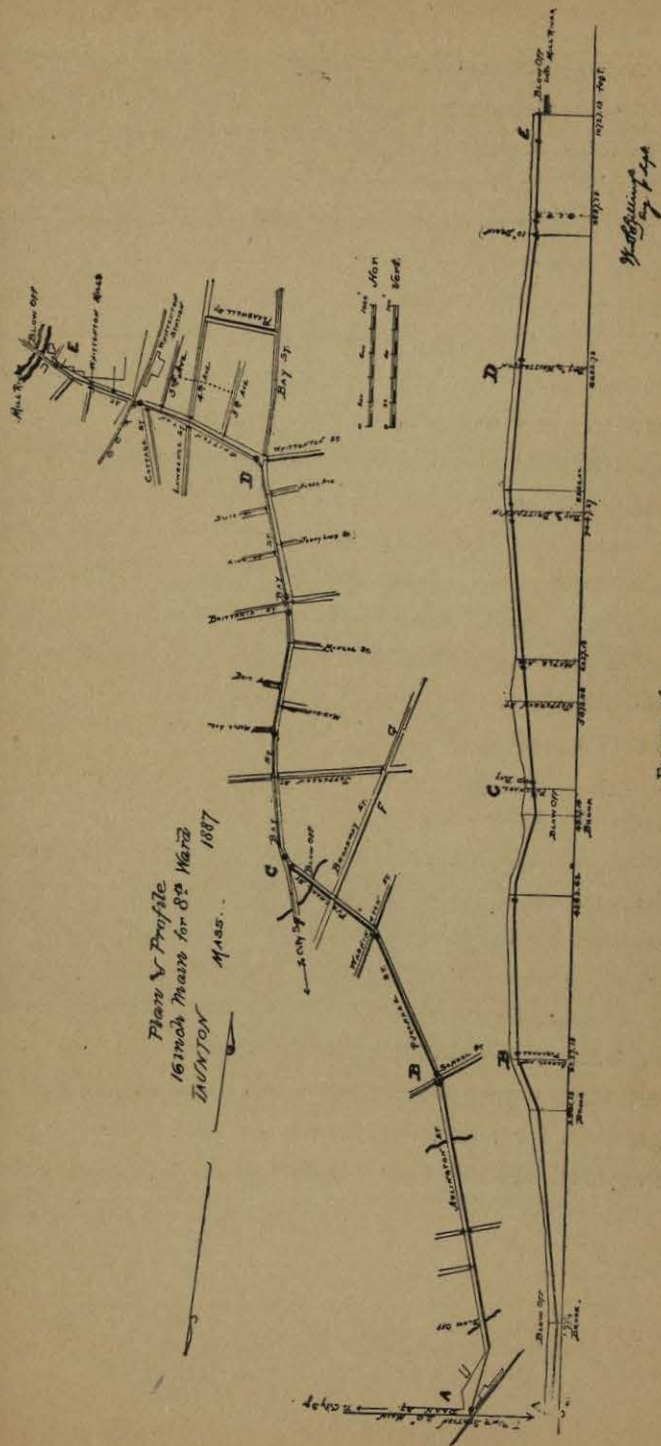


FIGURE 26.



A temporary supply for consumers on a cut-out section may be furnished (1) by carrying water in tubs or buckets from the nearest available hydrant; (2) by laying a screw-joint pipe along the curb line, with stand-pipes at convenient intervals from which the consumers can draw at their pleasure; (3) by laying the screw-joint pipe as in the previous case, and then connecting each service-pipe by means of hose at a point near the corporation cock. The last method was adopted, and it is made clear by the accompanying sketch, in which the conditions represented are such that water under pressure comes as far as the large gate in the trench. The section which is temporarily shut off begins in front of the large gate and extends to the next gate on the old line, which is coming up, or to a point on the old line, which may be conveniently plugged if the next gate is too far away. The temporary pipe near the curbstone is common 1½-inch screw-joint pipe connected with the hydrant by 1½-inch hose and special brass couplings, and supplies 1-inch branches taken off at convenient points, carried down as shown, and connected with each service by ¾-inch 4-ply extra heavy rubber hose having special couplings, the nuts of which screw directly on to the end of the 1-inch cement-lined service-pipes, making a joint with a leather washer.

## ITEMS OF COST.

*Purchase Street.*—In making preliminary estimates it is comparatively easy to get at the cost of materials, but the cost of labor and incidentals is oftentimes uncertain to an aggravating degree.

The following figures of cost of labor are believed to be as near the truth as it is practicable to get them without employing skilled clerical labor in keeping time.

Referring to the plan and profile it will be seen that Purchase Street for more than half its length is straight and practically level; it is forty feet wide, and, with the exception of a short section near Broadway, furnished sandy digging with some tendency to caving.

The crossing of the brook near Bay Street and the locating of the blow-off called for some comparatively deep digging—say ten or twelve feet in depth for 100 feet. The old 8-inch pipe was removed, and eighteen services were furnished with a temporary supply, and the total labor on this street cost \$729.62. The distance is, say, 2,100 feet, so that the cost per lineal foot was 34.7 cents for the section between B and C on the plan.

*Bay Street.*—This though not the most expensive section was the most troublesome, for the difficulties were discouraging. The street is forty feet wide, has a horse-car track running through its entire length, with cars passing about once in fifteen minutes; from Maple Avenue to Britannia Street the line follows a sewer-trench so closely that the caving of the banks was almost constant. The digging was dry and sandy. The sidewalk on the west side was appropriated and all the excavated material was piled thereon; planks were thrown across the trench to enable the occupants of houses to pass in and out, and hemlock boards against the open fences kept the sand and gravel from the grass plots. The old 8-inch main was removed, the supply maintained for fifty-three services, the movement of the horse cars was not obstructed, and



the total labor cost 41.8 cents per lineal foot—on section C D on plan.

*Whittenton Street.*—Here the digging was wet and dirty, but as the street is 65 feet wide there was ample room. Old pipe to remove, temporary supply to maintain for 30 services, and

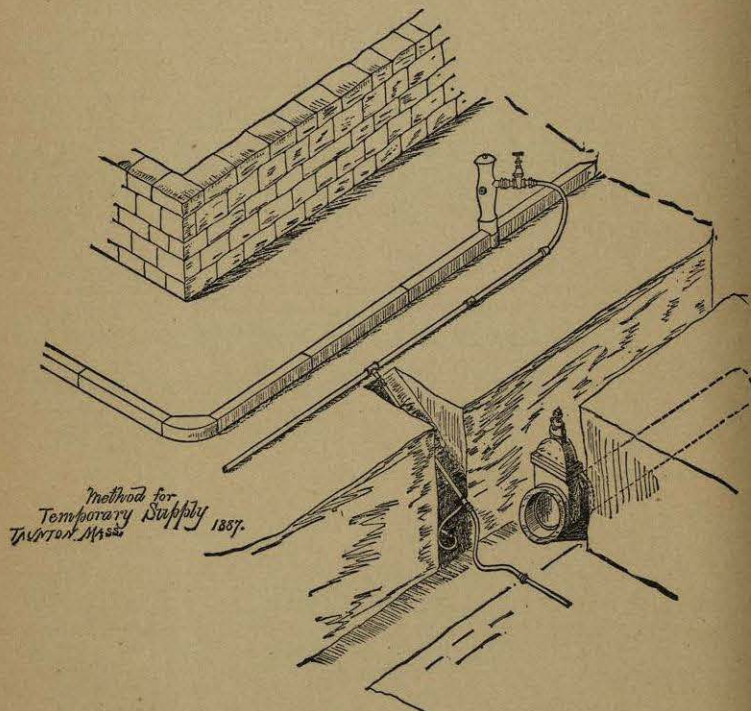


FIGURE 27.

four connections, new and old, made for the Whittenton Manufacturing Company at and near E on plan made the total cost of labor 47.4 cents per lineal foot. The mill connections were the principal causes of this increase in cost.

The foregoing figures are largely in excess of the cost of labor on ordinary pipe lines. For example, a detachment from the same gang of men who laid the pipe referred to above, laid about 2,000 feet of 8-inch pipe in new ground, good digging, at a cost of 17.3 cents per foot for all labor; two pieces of 4-inch, each about 530 feet long, for 13.1 cents per foot, and 600 feet of 6-inch for 15.38 cents per foot.

THE TEMPORARY SUPPLY.

The cost of work such as this will, of course, vary greatly with circumstances, for if new pipe and fittings must be purchased the cost will be much greater than it would be if old material and odd pieces can be worked up.

In this particular case we bought, expressly for this work, about half of what we used. The labor for the temporary supply-pipes footed up to \$230.29, or about 3 cents per foot, while the new material purchased cost nearly 4 cents per foot in addition. A little less than 7 cents per foot for the 7,800 feet of pipe required for the temporary supply was the cost as nearly as can be ascertained. The pipe supplying Third and Fifth Avenues, from the hydrant on Fourth Avenue, was laid on the surface across the lots.

The total cost of the line and its connections may be stated as follows :

16-inch pipe, 135 pounds per foot (@ \$34.50)....	\$22,698 09
6 and 4-inch pipe.....	563 52
Gates, hydrants, valves, globe special castings and sundries.....	7,728 56
Old style special castings.....	200 00
Labor.....	4,429 02
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	\$35,619 19