

Sand	0.65
Labor	162.99
Teams	32.00
Overhead charges	44.69

Total actual cost\$335.07
 Actual cost per ft., 4¼ cts.

The character of mud and incrustation encountered on this section of 4-in. pipe is shown in Fig. 3. It will be noted that the main was nearly closed. The deposit in this section of the city was mostly a yellow mud from the Ohio, with just a very thin scale of incrustation at the bottom of the main. The capacity of this main was increased 550 per cent. by cleaning.

Method of Cleaning Six-inch Pipe.

The method used in cleaning 6-in. pipe differs from the one described for cleaning 4-in. pipe chiefly in the manner of getting the cable through the main. Six-inch pipe can be cleaned at less cost, usually, than 4-in.

The consumers are notified, as before, and gates are closed to put the line out of service. In cleaning 6-in. pipe about 1,600 ft. makes a good draw. The opening at the large winch is first cut and about 3 ft. of pipe is removed. A 45° bend, with riser pipe attached, is calked on. The end next to the controlling gate is then cut, the water is pumped out of the trench, and the 3-ft. section of pipe is removed. The small winch, on which the small bright cord is wound, is placed over this opening. A leather carrier is used to pass the cord through the main instead of the rods heretofore described. This carrier preferably is made of a roll of leather just a little smaller in diameter than the pipe. A cup is sewed to the front end of the roll to prevent water from passing through it. A strong steel band is fastened to the rear end of the carrier to which is fastened the bright cord. A hatch box designed for use in subsequent cleanings of the main is placed in this opening next to the gate valve. The cover of the box can be removed during the cleaning operations and this saves repeated cutting of the main. A piece of pipe about 2 ft. long and large enough to receive the small cord is screwed into the removable cover of the hatch box. The cord is passed over a small reel, mounted in the hatch box, while it is going through the main attached to the carrier. This holds the cord in the centre of the pipe. After the cord is attached to the carrier, the hatch box is placed in the line. The hatch box has one bell and one spigot end. A sleeve is placed over the spigot end and the hatch box is calked into the line by means of watertight yarn joints. After this is done the gate is opened and the water comes in back of the carrier and pushes it through the 1,600 ft. of main in three minutes, more or less, depending upon the amount of incrustation present and the pressure on the line. As soon as the carrier reaches the end of the line of pipe to be cleaned it is detached from the cord. The cable is attached to the cord and pulled back to the hatch box by means of the small winch. This usually takes about one-half hour. The sleeve of the hatch box is then driven off and the box removed. The water was shut off, of course, when the carrier was removed. The 6-in. cleaner is then attached to the cable and is drawn into the pipe line. After the joints near the gate are again made up the gate is opened and the machine driven through the pipe as in the case of the work on the 4-in. line already described.

Patented metallic carriers have been used, but they are not as satisfactory as the roll of leather described. The long tube of leather should be so designed and cut as to bear only

at each end, the middle not touching the pipe at all. It will then go around any curve in the line and is readily withdrawn if it gets stuck. Metallic cup carriers are hard to draw back if they get jammed.

In one case a hydrant located on 1,115 ft. of 6-in. main threw water only 2 ft. before the main was cleaned. After 2 cu. yds. of incrustation had been removed by the machinery and methods described in this article the hydrant threw water a distance of 37 ft. from the opened hose connection.

Cost of Cleaning Six-inch Water Mains in Louisville.

The contract price for cleaning the 6-in. main on 9,183 ft. of main for labor and material, was 8 cts. per foot. The total contract price was \$734.64. On this work the small cord was carried through the mains by means of the carrier.

Actual Cost.—The actual cost for labor and material was as follows:

33 6-in. sleeves	\$ 55.77
9 ft. of 6-in. pipe	3.30
Lead	11.72
Yarn	0.39
Cement	4.60
Sand	0.60
Labor	131.69
Teaming	24.00
Overhead charges	28.00

Total actual cost\$260.07
 Actual cost per ft., 2.83 cts.

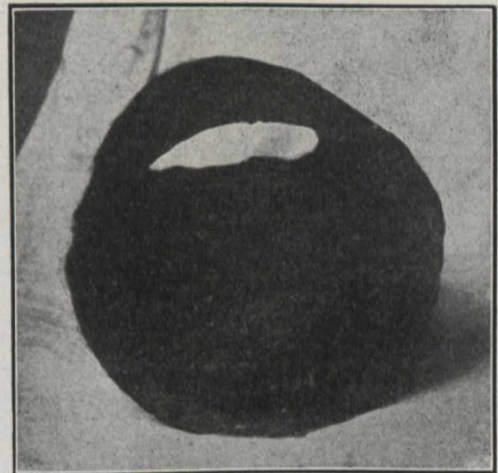


Fig. 3.—Section of Six-inch Water Main Before Cleaning, Louisville, Ky.

The writer also cleaned water mains in Middletown, Pa., for the Middletown Sawtara Consolidated Water Co., and found the cost of the work there about the same as in Louisville. The writer knew of one case in the East where about five miles of 20-in. main was cleaned at a contract price of 60 cts. per ft. This price was exorbitant. As a matter of fact the entire five miles of pipe were cleaned in about two weeks at a total cost not exceeding \$1,500. It has been the writer's observation that such exorbitant prices have kept many water companies from cleaning their mains by contract. Although the writer has sold his patents and is no longer in the water mains cleaning business he will be glad to answer questions without charge relating to the manner of doing the work, and will make sketches of the machinery to be used. It is the judgment of the writer that water companies would save a great deal of money by cleaning their own mains.