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METHODS AND COSTS OF CLEANING WATER MAINS.

The cleaning of water mains is a matter of much interest to the engineer engaged on municipal work. The following article by F. Osborne Redford, which appeared in a recent issue of *Engineering and Contracting*, gives the methods and costs on certain work of this kind.

The writer of this article was formerly employed with the original water main cleaning company in the United States and during the spring of 1909 resigned and promoted the American Water Main Cleaning & Contracting Company of Louisville, Ky., and during the summer of 1909 cleaned some 15 miles of 3, 4, and 6-in. water pipe. Some of the mains had been laid for 40 years, yet little difficulty was encountered in restoring them to their original inside diameter.

Fig. 1 shows the form of water main cleaner invented by the writer. The form of construction of this cleaner shows its adaptability for this class of work. It cleans all foreign matter out of the main and leaves no part of the inner surface of the pipe untouched. The machine is designed similar to a flue cleaner, having a piston at each end to

its diameter by means of the spiral spring in the rear piston, while as soon as it has passed it retains its former size.

It has been our experience that when this machine comes in contact with a piece of lead in the water mains where a poor joint has been made by the calker by allowing the lead to run into the main, which retards the progress of the water to a certain extent, the machine will cut its way through the lead, leaving a smooth bore without damaging the joint. In such cases the lead usually will be caught on the scrapers. We have brought pieces of lead out of the mains weighing twenty-five pounds, which had been poured in by some careless calker. With a machine of this design the diameter can be increased from $\frac{1}{4}$ to $\frac{3}{4}$ in. depending upon the hardness of the incrustation to be removed. The scrapers are set at an angle so they will overlap each other, allowing no part of the pipe to remain untouched, and furthermore to allow the machine to pass the joints safely without dropping in and tearing away the joint lead and possibly breaking the cutters.

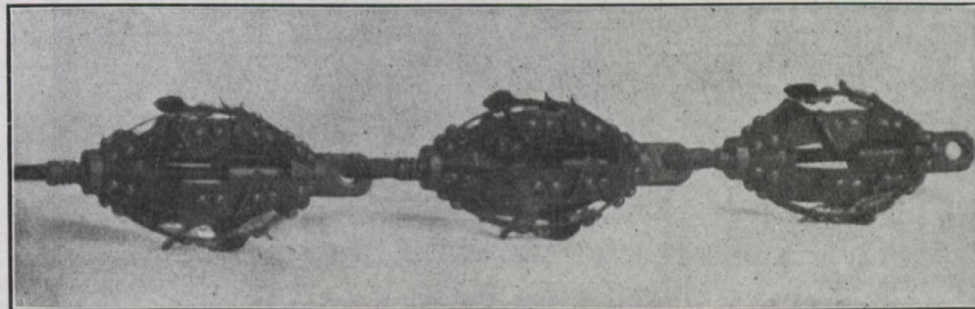


Fig. 1.—Form of Water Main Cleaner.

support the spring straps which are screwed to the pistons, on which are screwed scrapers or cutters that bear against the inner surface of the main and remove the tuberculation. After the machine is assembled, leaving out the connecting rod, it is put on a universal grinder, on centers and the cutters are ground to exactly the size of pipe the cleaner is designed to clean. After this is done the spiral spring is placed in the socket in rear piston, the piston being bored about half way through so as to allow the spring to press against the seat, and extend about 1 in. outside of the piston. The connecting rod is then screwed into the front piston until the collar on the rod meets the spring. If it is desired that the machine be increased in size $\frac{1}{4}$ in. the connecting rod is unscrewed and the machine expands. After the machine has been set to the desired size a little set screw is put into place in the rear piston, being screwed into key seat in the connecting rod to keep the machine from coming apart while going through the main. The pistons used in these machines were made of bronze and drop-forgings, the front piston being made of the latter. Usually three of these machines are connected together, so if any part becomes broken the other can take up its work.

In case the machine comes in contact with a corporation cock while going through the main, it immediately reduces

The machine used for cleaning larger size pipe such as 8-in. and over is of similar design, with a double plunger in the rear so as to propel the machine with water power, thereby doing away with the cable used with the smaller type of machine. We used a double plunger for the reason that in passing a main larger than the one we are cleaning, the machine would stop at the cross, and allow the water to pass the machine, whereas with a double plunger, one set about 2 ft. apart depending upon the crosses we pass, we are able to get the front plunger past the cross, while the rear plunger is still on the other side. Then the pressure of the water behind the front plunger will force the machine past the cross without stopping. The larger machines are usually made of two sections and a plunger. The sections are connected with a joint that can be made rigid when a straight line of pipe is to be cleaned, and flexible when curved sections of pipe are encountered. There are four rods with ball and socket joints where the machine connect. These rods are screwed into the plunger and connect into a plate in the front of the machine into which a hook is screwed which engages the front hook of the machine. As a result of this arrangement the force of the water against the plunger pushes the machine and at the same time pulls it and keeps it from becoming cramped in the main. The