LAYING SUBAQUEOUS WATER MAINS AT ROME AND MERIDIAN.*

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While Superintendent of Public Works at Rome, Ga., the writer had three crossings to construct, one through Silver Creek and two through the Etowah River. The creek was to be crossed close to a highway bridge, and it was deemed preferable to lay the pipe on the bottom of the creek rather than to suspend it from the bridge, or to lay it on the floor, on account of the sudden rises and heavy floods in the stream. The creek was 60 ft. wide between banks at the street level, 40 ft. wide at low water, and, at ordinary low water stage, was 12 ft. deep.

Ten-inch cast-iron pipe with the John F. Ward flexible joint was used. It weighed about 87 lb. per foot or 1,034 lb. per section of 12 ft., and cost 2 cents per pound delivered in Rome. The limit of deflection of this joint is said to be 15 deg., though experience at Rome indicated that it was not safe to use the limit, 12 deg. being safer.

The line of five 12-ft. lengths was made up on a platform spanning the creek at the street level and then lowered by tackle into the stream, the two ends being kept clear of the water for later joining to the water mains on each side of the creek. The submerged part was gradually lowered, thus allowing deflection, until it rested on the bottom. The pattern of the Ward bell and spigot being different from the design of ordinary cast iron pipe, the two were connected by short pieces designed by the consulting engineer, Mr. J. N. Hazlehurst, who was in responsible charge of both engineering and construction.

After the Ward pipe was attached to the street main a test for leakage showed a loss of 28,000 gal. per day of 24 hours. This being excessive, a diver was sent into the water, who discovered that the limit of safe deflection had been exceeded, causing three lead joints to leak very badly. The creek line was detached at each end and raised. All joints were recalked, the bottom of the creek partially filled with small boulders to reduce the deflection of the joints to about 12 deg. and the pipe again lowered and tested. The next test showed a leakage of about 380 gal. per day. Later this joint was again calked and the leakage reduced to about 150 gal. per day. The pipe was covered with boulders and no trouble has since been experienced with it.

The cost of this work approximated $300, everything included, or $5.00 per lineal foot.

The first river crossing was at a point where the banks rose about 40 ft. above low water. A wire cable was stretched from bank to bank, to which trolleys for carrying the supply boat and pontoon raft were attached. The pontoon for laying the pipe in the river was constructed as shown in the diagram. The flotation was provided by 25 empty oil barrels lashed together with ½in. manila rope, the barrels being laid in three rows with a "slot" in the middle row at the stern of the raft. The wood-work was so left as to make it easy to transfer the "slot" from the rear to the front.

Two trolleys with the necessary tackle were attached to the wire cable and secured to the raft, and a supply boat was attached to the cable almost immediately beneath it, this boat carrying extra lengths of pipe, pigs of lead, yarn, melting pot, etc. The pontoon carried nothing but a tripod of 2-in. wrought iron pipe supporting a triplex block for handling the pipe. The outfit was moved across the river by a hand rope.

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The first joint was secured to a dead-man on the bank by a heavy chain. The outfit was pushed off, the bell of the pipe being forward, the second joint fitted in and calked, the outfit moved forward again with the next pipe, and this was repeated until the other bank had been reached. The "slot" was then moved to the front end of the pontoon by removing a part of the deck and the short row of five barrels to the stern, thus leaving the last joint of pipe ready for attachment to the forward shore of the river and to the ordinary 10-in. cast iron pipe.

The short joints of pipe for joining the Ward with the ordinary cast-iron pipe were made to lay 3 ft. One had a standard bell on one end and a flexible joint bell on the other and one had a standard bell and a flexible joint spigot.

After the laying was completed two joints on each end of the river pipe were fastened by heavy hog chains to deadmen permanently constructed in the banks.

Before pipe laying was begun the river bottom was sounded. It consists of solid rock, slaty limestone, with three ledges running longitudinally, each ledge having practically the same elevation. These ledges were notched with dynamite and the pipe while being laid was fitted in the notches. These notches secured the pipe from deflection downstream.

The length of this river crossing was 216 ft. and the time required for preparation and actual laying was about 6 days. The work was done under a construction superintendent, who also performed the duties of foreman, a straw boss or gang foreman and five laborers and one water boy, the pipe laying cost being about 35 cents per foot. This particular job cost about $700 all told.

The second river crossing was made with 12-in. pipe. The river was somewhat wider and deeper; no notches in rock had to be cut and no channel to be prepared. The cost was approximately $900. It required less time than the first on account of the experience gained then. The work was done when the river was at the lowest stage known for years. The people were saved upward of $3,000, a waterworks contractor, who had done similar work in Rome, though pursuing a different method, offering to do the work, no material included, for $3,500, the cost of material being approximately $1,200, including equipment.

On each side of the streams through which the pipes were laid valves were placed for cutting off the crossings in case of emergency, and it was by by-passing these valves that it was possible to make the tests heretofore mentioned. One valve at each crossing was enclosed in a manhole, into which was tapped the main on each side of the valve, the inlet tap being ¾ in. and the outlet tap 1 in. Lead connections were attached to the taps and the other ends connected to a sensitive 1-in. meter, thus by-passing the valve which, with the other across the stream, was shut off. The water was turned on at the ¾-in. inlet tap slowly and as slowly let out at the outlet 1-in. tap. As soon as the meter and outlet connection had filled the meter ceased to operate, apparently showing that there were no leaks in first river crossing. The meter was removed and examined, replaced and the line tested with the same result. Both river crossings were tested quarterly with the same results during the writer's service in Rome.

The writer has recently completed another crossing through a stream at Meridian, Miss., by a method entirely different from that at Rome. The two reservoirs at Meridian are some two miles from the city, and it was in laying a 20-in. cast-iron pipe to bring more water to the city that the stream was crossed. The elevation of the bottom of the reservoirs is only 5.4 ft. above the bottom of the settling basin in the city, the elevation of the top of the dam, at high wa-