

## CORROSION OF SERVICE PIPES\*

SOME trouble has been experienced with corrosion of service pipes, presumably due to the carbonic acid in the water, and a series of tests were made with the waters from the different purification plants. At Mt. Hope, 48 ft. of new  $\frac{3}{4}$ -inch galvanized wrought iron pipe was tapped into a 4-inch cast iron main running through the pipe gallery, which furnishes the supply of water for the ordinary daily use in the camp. An ordinary brass faucet was placed on the discharge end. Water was turned into this pipe on June 23rd and run through it continuously, with two exceptions, at the rate of about 1 gallon per minute from 8 a.m. to 5 p.m. each day. From 5 p.m. to 8 a.m. the water stood in the pipe, the faucet being closed. Each morning daily determinations of alkalinity, free carbonic acid, color and iron were made of samples of the first water drawn off in the morning, designated as "over-night" samples; also of running water collected about one hour later and designated as "running" samples. The pipe was under observation for 373 test days. Up to August the free carbonic acid in the "over-night" samples was much higher than in the "running" samples. The alkalinity was lower, and the color and iron were about equal. The free carbonic acid ordinarily ranged between 35 and 40 parts per million in the over-night samples and 3.5 to 5.0 in the running samples. After September 20th the free carbonic acid contained in the over-night samples was less than that in the running samples.

It was concluded from these tests that the effluent from this filter plant exerts only a slight corrosive action on pipe that has been properly galvanized, and will form only a thin coating on the interior. This conclusion has been corroborated by examination of the pipe used in this experiment and also of a service pipe from Cristobal.

Similar experiments were made on lead pipe with effluent at the Agua Clara purification plant, 25 ft. of new

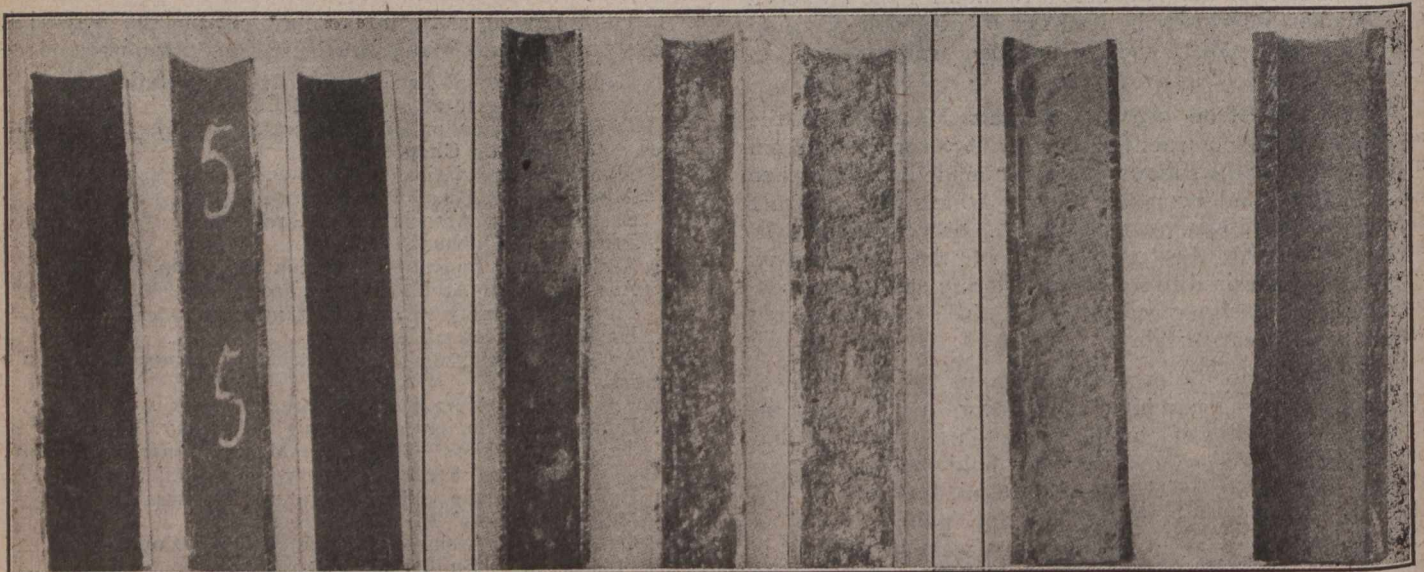
\*Abstracted from 1917 report on Water Supply for Municipal Purposes in Panama Canal Zone.

1-inch lead pipe being used. In the over-night samples the amount of lead increased to a minimum of 2.33 parts twenty-one days after the water was turned into the pipe, and from this time there was a decrease, and three months later the lead contained in 19 out of the 21 samples was 0.3 parts or less. As would be expected, the amounts of lead dissolved by the water standing over night diminished as the free carbonic acid was replaced with carbonate alkalinity. Of the running samples, only three contained as much as 0.1 part per million, and the majority less than 0.06 part. At the end of the test a section of the pipe was split, and the inside was found to be covered with a very thin coating of calcium carbonate. From these experiments the conclusion was drawn that the use of lead service pipes in the districts supplied by water from this plant is attended with no danger of lead poisoning so long as a carbonate alkalinity is maintained. It would be advisable, however, to allow the water which has been standing over night in a lead service pipe to run to waste during the first two months after its installation.

At this plant a test was made of the effect on galvanized iron pipe also. Throughout this experiment, lasting 380 test days, the alkalinities of the over-night samples were higher than those of the running samples, but the difference was always less than on the first two days, ranging from 1 to 11 parts. The colors of the over-night samples also were always higher than those of the running samples. They were also always higher in iron.

Gravimetric determinations of zinc were not made on the water from the galvanized iron pipe, but at the end of the run the residue from 100 c.c. of an over-night sample was tested micro-chemically and zinc crystals obtained; while a similar test of a sample of running water, collected on the same day, showed the absence of zinc. There was a cloudy appearance of the over-night samples that may be explained by the presence of iron and zinc in suspension.

While it was known that galvanized iron was not suitable for service pipes with a filtered water of low alkali-



Split Service Pipes, Showing Interior Conditions

- |   |  |
|---|--|
| <p>No. 1.—Galvanized iron pipe removed after 5 years' service. Galvanizing removal and iron incrustation due to low residual alkalinity and free carbonic acid in filtered water.</p> <p>No. 2.—Experimental galvanized iron pipe at Mt. Hope purification plant. In service one year.</p> <p>No. 3.—Galvanized iron service pipe removed after 10 months' service, Ancon, C.Z. Water from Miraflores purification plant. Thin coating of iron oxide.</p> | <p>No. 4.—Experimental galvanized iron pipe at Agua Clara purification plant. In service one year.</p> <p>No. 5.—Experimental galvanized iron pipe at Agua Clara purification plant. In service one year.</p> <p>No. 6.—Galvanized iron pipe removed after 7 months' service from a house connection in Gatun, C.Z.</p> <p>No. 7.—Service line to Incinerator, Gatun, C.Z. Flow through pipe about 3,000 gallons per month.</p> <p>No. 8.—Experimental lead pipe at Agua Clara purification plant.</p> |
|---|--|