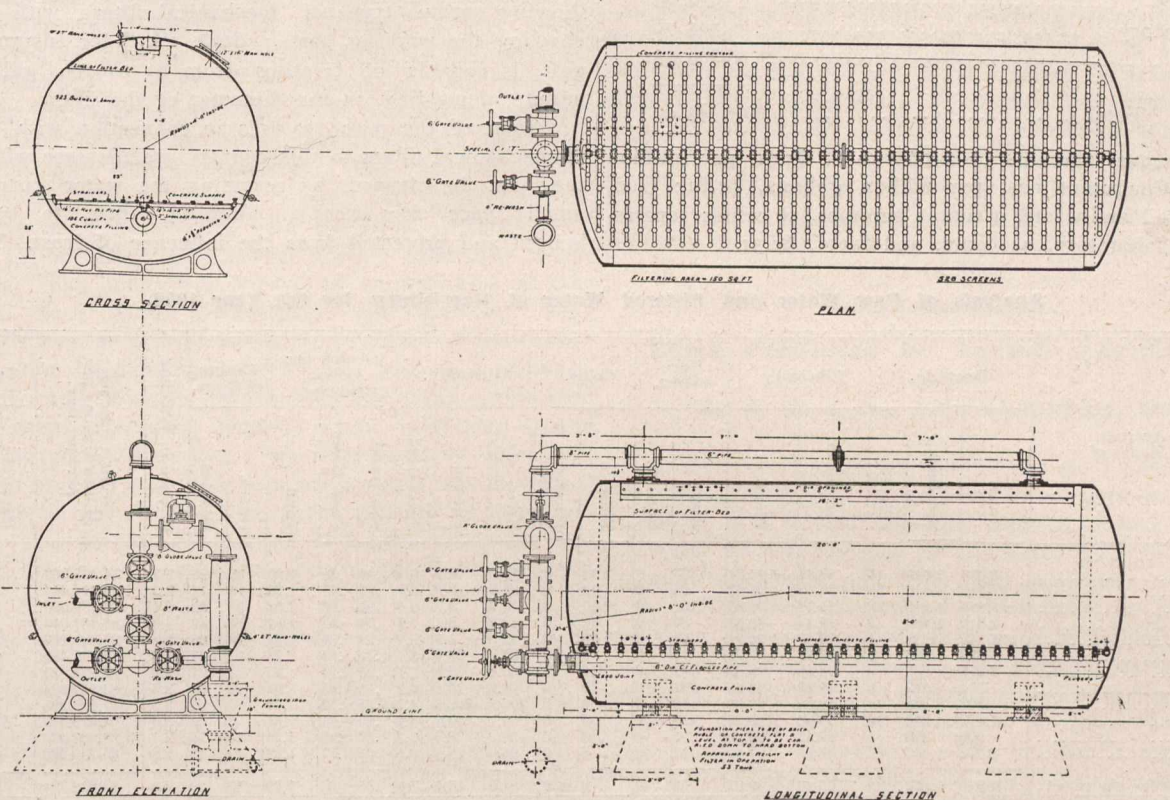


filter; the bacteria remaining is a test of whether the water can possibly be made into a drinking water by the process.

We have said that the addition of a coagulant greatly improves the quality of a filtrate. In this connection we would quote from a Report of the "Joint Special Committee to Examine and Report Relative to the Pollution of the

steam is condensed into drops, it would follow that they would be caught and held from going through the filter. This is accomplished by adding dissolved sulphate of alumina (alum) to the water as it flows to the filter.

"The amount required is from almost none at all to about three-quarters of a grain, according to the state of



Sectional Views of Roberts' Standard Horizontal Pressure Filter.

Water Supply and the Best Method of Filtration."—City Document No. 15 of the city of Providence, R.I. :—

"If the diameter of matter floating about in water is much less than that of the interstices between the grains of sand composing the filter-bed, such matter, except as much as is caught upon the sharp edges of the quartz, will go right through the filter with the water.

the water, say, an average of from one-quarter to one-half grain per gallon in the ordinary condition of the Pawtucket River water.

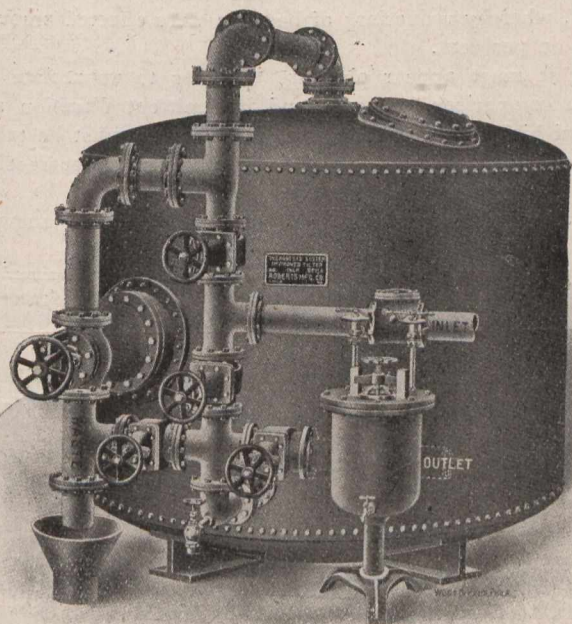
"The action is the same as when coffee is cleared by means of the white of egg. No white of the egg goes to the drinker of the coffee—it is all drained out with the grounds; and, as no alum goes to the drinker of the water, it unites with the impurities in the water and settles in feathery flakes of insoluble hydrate on the top of the filter, and is washed out with its accumulation of impurities when the filter is cleaned.

"The analysis of the purified water shows no trace of the alumina used, while the analysis of the wash water shows that the alumina is all washed out with other impurities. This feathery bed of precipitate flakes produced by the alum forms a filtering material of insoluble mineral matter which is well nigh perfect in its character. Bacteria are like the very fine particles of clay of some water, so small as to pass the sand or quartz, but they are caught by the feathery precipitate of alumina hydrate, much as the bacteria contained in the air are prevented from entering a vial closed with sterilized cotton."

The above is a very lucid and exact description of the use of a coagulant, and its importance in connection with a filter will be at once appreciated when understood. With reference to the amount of alum required, we may state that one drop of alum solution in one hundred drops of fresh water is an appreciable proportion, and would probably impart a slight taste; one drop in one thousand is scarcely comprehensible; one drop in ten thousand is inconceivable, and would be difficult to detect by the most delicate chemical tests.

One drop of alum in solution to one hundred thousand drops of water (about six-tenths of a grain to the gallon) is sufficient to render an average turbid water bright.

The operating expenses for the Harrisburg mechanical filtration plant for the year 1908 were as follows: Treating 3,358,029,150 gallons, of which 3,271,782,550 were delivered



Roberts' Steel Tank "L" Filter.

"Now, if a substance could be introduced, drop by drop, into the water before it comes to the filter-bed, which would have the effect of curdling the matter together, so that every one hundred or so of the smaller particles were made to join together and become one large particle, much as vapour or