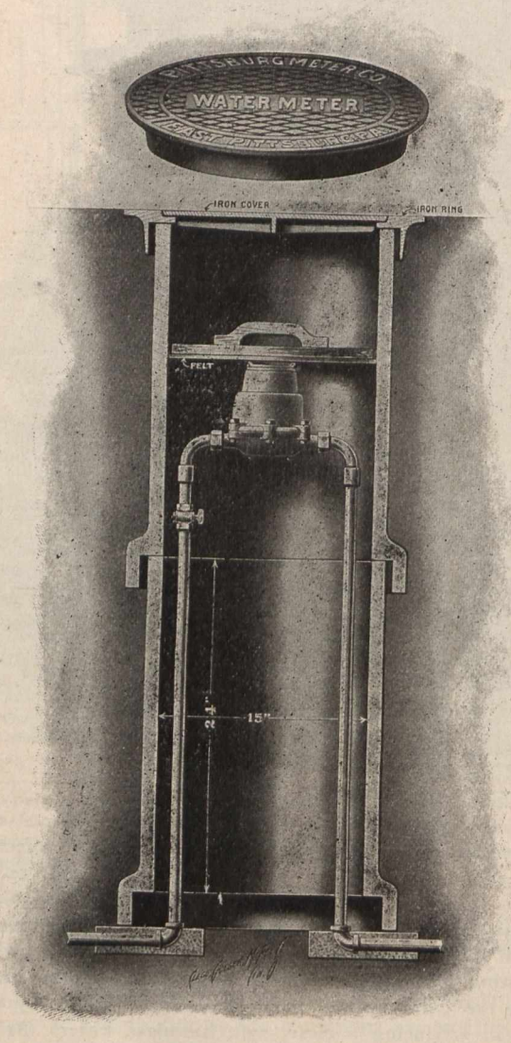
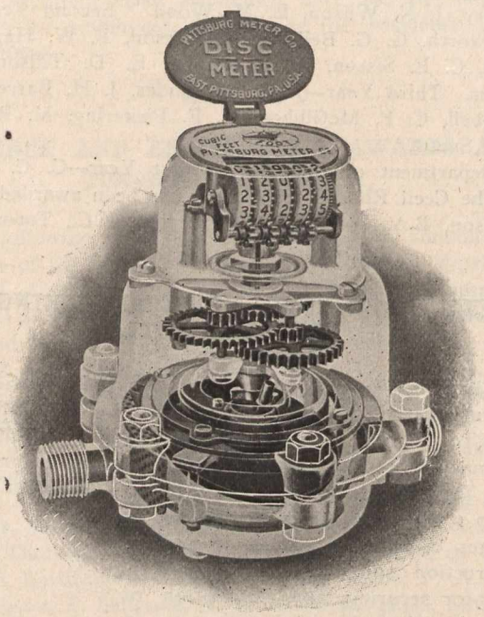
Analysis of scale taken from boilers in the affected districts shows that incrustations are chiefly composed of carbonate of lime, carbonate of magnesia and sulphate of lime. The carbonates are insoluble in pure water, and owe their presence in springs and rivers to free carbonic acid, which forms with them soluble bicarbonates. Boiling such water expels carbonic acid, and the carbonates of lime and magnesia separate and deposit in the form of insoluble powders, which, in combination with organic matter, bake into scale. The action of Keystone tri-sodium phosphate upon these insoluble carbonates is to convert them into phosphates of lime and phosphate of magnesia, substances resembling snowflakes in appearance. It also neutralizes the carbonic acid released from the carbonates of lime and magnesia, preventing all corrosive action. The manufacturers have such unbounded faith in the goods they manufacture that they are not only willing to send their book, "Worth Knowing," to anyone having trouble with scale in their boilers, but are willing to make analysis of the feed water and ship a sufficient quantity of the chemical for thorough trial, free of charge, that its value may be demonstrated.

SETTING WATER METERS.

Where water meters are to be set outside, the method illustrated herewith may be employed to good advantage, as this mode of installing meters is inexpensive and has been adopted by a large number of Water Departments with satisfactory results. The meter box, as shown, cohsists of two sections of 15 inch vitrified sewer pipe, resting on a brick foundation, and covered with a strong, corrugated cast-iron ring and cover. In localities subject to hard frost the wooden lid shown may also be installed. The bottom of this lid is covered with felt, and rests lightly on the top of the meter, thus forming an air space between the meter and the outer cover and retaining the heat which arises from the warm earth below the frost line, thereby preventing the meter from freezing. The depth of this box may be increased by the addition of another length of sewer pipe, or by adding to the height of the foundation underneath; the foundation can be built either of concrete or brick laid dry, depending upon the character of the soil; or, in fact, any other changes desired may be made to meet local conditions. The meter box, as illustrated, is supplied by the Pittsburg Meter Co., of Pittsburg, Pa., and is capable of accommodating either a ⅝ inch or a ¾ inch water meter. The company supplies the iron rings and covers, as illustrated. A ring and cover weigh about 65 lbs. The other materials required for the construction of this type of meter box are easily obtained anywhere.





WORTHINGTON CENTRIFUGAL PUMPS.

Few problems in the field of hydraulics present more interesting possibilities and at the same time have been so universally neglected as centrifugal pumping. The centrifugal pump is the converse of the turbine water-wheel. Its development has been analogous to that of the steam turbine in that both were pioneers in their respective fields, and both were abandoned in favor of reciprocating machines before having been thoroughly exploited, the pump because the principles of its action were not clearly understood, and the steam turbine because of mechanical difficulties in construction.

The earliest history of the centrifugal pump cannot be traced, but it is known that centrifugal machines for lifting liquids were in use during the latter part of the seventeenth century. About 1703, Denis Papin, the famous French engineer, designed his Hessian Suck, a form of centrifugal pump embodying nearly all of the essential features of the present day machine. Drawings of this pump are in existence which show that Papin was not only a designer of no mean ability, but that he had a good comprehension of the principles with which he was dealing. After Papin there seems to have been no further development of his ideas until 1818, when the earliest prototype of the present form of centrifugal was brought out in Massachusetts, and has since been known as the Massachusetts pump. This pump was of the type herein designated volute, and was provided with double suction openings and an open impeller. It was reinvented by Andrews and others in 1846, and was shortly afterwards introduced into England by Mr. John Gwynne.

The commercial history of the centrifugal pump dates from the year 1849, when Appold exhibited a model at the meeting of the British Association at Birmingham. During the next two years he so improved on his first model that his pump became one of the chief features at the Exhibition in