Engineering, Civil & Mechanical.

FRAGER'S WATER METER

In 1872, M. Frager introduced to the notice of water-supply companies a new water meter, which was very favorably received, and which from that time to the present has been extensively used by the companies supplying water to various of the larger towns and cities of France. Recently the inventor has greatly modified the construction of the apparatus, so that it is exceeding simple, moderate in price, and is not influenced in its correct working by variations in pressure. The operation of this meter, which is shown in the annexed cuts, is as follows:—

The water enters the meter through the inlet pipe, which empties at the top of the distributing box. It traverses a sieve, which serves to remove the larger impurities, and exerts its pressure against the slide valves T and T'. This pressure is transmitted to the measuring cylinders, C_1 and C_3, from the cylinders, O_1 and O_4, which stand open. Since, at the same instant, the orifices, O_2 and O_3, are in communication with the outlet pipe through the intermedium of the ports of the slide valves which cover them, the spaces, C_2 and C_3, are in a state of discharge, and the pistons P and P", which separate these chambers from the first, tend to displace themselves toward the left. The piston, P', abutting against the end to the left, by the extremity of its rod, remains immovable; but P moves forward toward this same end, and, striking against it, admits a cylinderful of water into C^1, at the same time expelling a like quantity of water from C^3. Before reaching the limit of its travel, it displaces the slide valve, T', which uncovers the orifices, O_3, and covers up the orifice, O_4. As a consequence of these displacements the pressures are reversed in the cylinder, C^1; C_2 is charged; C^4 is discharged: and the piston, P. shoved toward the right end, drives a second cylinderful of water into the discharge pipe. Before stopping at the end of its travel, it displaces the slide valve, T' which uncovers O_3, and covers O_1. Owing to this displacement, the pressures are reversed in the cylinder, C_1, and C_3 is charged, while C^1 is emptied. The piston P, moves toward the right, driving a third cylinderful of water into the discharge pipe, displacing, on arrival at the end of its travel, the valve, T, and thus causing the expulsion of a fourth cylinderful of water by the piston, P'.

The different parts of the mechanism have now returned to their starting point, except the ratchet wheel, R, which has moved forward but one tooth, while the apparatus has been distributing the four cylinderfuls of water. This ratchet wheel actuates the clockwork which registers the quantity of water that passes through the meter. The movements just described take place as long as the inlet cock remains open.

It only remains to add a few complementary details.

Each piston, toward the end of its travel, actuates the valve which distributes the water into the other cylinder. To effect this the piston rod carries two cams, H_1 and H_3, or H_2 and H_4, which alternately act on the friction roller at the lower extremity of the controlling lever, L or L'; the latter moving on the axle, A or A'. The eccentric head of this axle is situated under the port of the slide valve (in a compartment separated from the one which operates to distribute the water) in such a manner that it pushes along the valve and carries it around the axle, now over the right orifice, and then over the left one. The mechanism which transmits motion to the clockwork is also very simple. The lever, L, carries a pawl, Q, moving about a vertical axle. When the lever is placed toward the left the pawl engages with the ratchet, R, and causes it to move forward one tooth in pivoting itself around its own axis. When the lever turns backward the catch of the pawl becomes disengaged, and is carried back to its starting point by the action of the centre of the ratchet wheel on the tail of the pawl. The ratchet wheel itself moves the clockwork by means of an axle, which, after passing through a stuffing-box enters the clockwork case. Finally, the meter is provided with an ingenious arrangement which allows the fact to be ascertained at any moment as to whether the apparatus is water-tight. To effect this object, the cams, H^2 and H^4, of the piston P', are made helicoidal in shape, so that if the piston rod, (and consequently the cams) be revolved about half a turn to the left, the cam, H_2, in consequence of its peculiar shape, is thrown out of the way and no longer engages the lever L', to a sufficient degree to displace the slide valve, T. The piston, P, will then remain pressed close up against the left end of the cylinder, and the piston, P' against the right end. The meter will thus stop working, and the flow of water will cease entirely if there be no leak. To set the meter in operation again, it is only necessary to move the stoppage eccentric back to its first position, when the helicoidal flange of the cam, H_2, acting on the lever, L', and displacing the slide valve, T, will put the apparatus in motion. If after bringing back the stoppage eccentric to its proper position, it be immediately turned to the left, the apparatus begins operating and stops anew after dist ibuting four cylinderfuls. It is easy then to ascertain: (1) Whether the meter has any leaks; and (2) whether the capacity of the four measuring cylinders is in proper accordance with the clockwork.

The apparatus is easily taken apart and put together again, and, as regards construction, is exceeding strong. With the exception of the piston packing (which is rubber), all the parts are of metal. There is hardly any need of speaking of the applications which may be made of the water meter. But, there is one, however, which we consider proper to dwell on, since it offers to manufacturers a means of controlling the operations of their generators and engines. It is the measurement of the feed water. By a special arrangement, the meter may be placed on the supply pipe of the feed pump. There is a safety valve provided for the prevention of accidents, and a check valve for preventiag back flow from the boiler. From the very construction of the apparatus, it is able to work equally well with either hot or cold water. The exact knowledge of the quantity of water vaporized by the boiler allows, by comparison with the weight of coal consumed during the same time, of ascertaining with the greatest certainty the cost per pound of steam, and of determining the choice of coal. Besides this, if the revolutions of the driving shaft of the engine be counted, the expense of steam per revolution of the flywheel may be estimated; and thus the movements of the engine can be regulated so as to prevent that increase in the consumption of fuel which follows an excess of speed. The use of the water meter and of the revolution counter results then in a considerable reduction in the expense of fuel, while at the same time it allows the behavior of the boilers and engine to be ascertained at any moment.—*Scientific American.*

Scientific.

AUTOMATIC ELECTRIC TIME SIGNALLING APPARATUS.

—Shuey's. This ingenious instrument automatically secures absolute precision of time in the ringing of warning and starting signals for railroad trains, street cars, steamers, and wherever the ring of bells or sounding of other signals is required at any predetermined periods of time.

To any good clock or regulator are attached contact points which close an electric circuit between a battery and the signaling instrument every minute. Where minute-moving electric dials are in use, no change in the clock is necessary, as the instrument can be placed in the same circuit which controls them. The time wheel of the instrument is provided with a hole in its periphery for every minute in twenty-four hours—1,440—and by means of its electrical connection with the regulator it is moved one step at each minute oftime. To set the instrument to any time table, it is only necessary to place a small metallic screw in the hole corresponding with the hour and minute at which each train is to leave the station.

Each screw in its proper place will not only cause the starting bell to strike at precisely the right time, but will, in addition, sound a warning of two, or three, or more blows upon the same or other bells at two, three, five or any number of minutes in advance of starting time, according to the requirements of the railroad company, the instrument being easily adjusted to operate any system of warning and starting signals already in use.

The time wheel once arranged in consonance with the time table, the signals are automatically repeated day after day, until a change in the time table is made.

The signals may be sounded on one or many bells of any size and at any desired distance from the clock or instrument

By the use of a conveniently arranged switch, the automatic contact points may be instantly cut out, and hand-push buttons on the instrument placed in the gong circuit for use when trains are late or special, or at any time when a temporary suspension of the regular signals is desired without making a change in the time table.