

of opening and closing the flap-door was recorded by a glass stylus, the point of which followed closely in the track of the fountain pen, and derived sufficient ink from the moist track to make its mark when the lever was moved. The mark indicating the movements of the door was on the opposite side of the line to that indicating the seconds, so that there could be no possible confusion between the two marks even when occurring at the same point of the record. A stop-watch was also used, as a check against large errors, and also to indicate during any experiment the time which had elapsed since the start; so that the observer would, after one run at a given head, know when the tank was nearly full. The duration of every run at a given head could thus be made approximately the same, so that the total quantities discharged would be approximately equal, and any large errors in reading the scale of the tank detected at once.

*Experimental Work.*—The water in the flume had, of course, to be kept up to the crest of the weir; before an experiment, therefore, the orifice was opened and the water run to waste for ten or fifteen minutes, to allow the water to attain a steady head above the crest of the weir, so that at the opening and closing of the flap-door the flow at every point would be steady. During this time the inlet valve of the tank was adjusted, the chronograph record placed in position, and the gauge of the measuring tank read. The temperature of the water in the flume did not differ by more than a few degrees from that of the water issuing from the orifice, or as finally measured in the tank, so that no appreciable error was introduced, especially as the quantity of water measured was so large and the temperature very nearly that of the maximum density of water, the experiments being made during the winter months.

During the course of each experiment the head was kept under constant observation, and the temperature of the water issuing from the orifice taken at frequent intervals. The temperature was also taken in the measuring tanks when the quantity was read, but no correction has been made for the difference between this reading and that of the orifice, as it never amounted to more than a few degrees Fahrenheit, and the resulting error was well within the limits of error of the other measurements. This introduces the subject of the probable accuracy of the determinations.

*Q.*—The total quantity discharged during one experiment was never less than 1000 gallons, and in some cases was 2000 gallons, these latter being in the experiments on the two-inch orifice at high heads. On the scale of the tank 0.87 inch corresponded to