instrument is mounted a float with indicator which indicates the height of water in either delivery or weir tanks by opening and closing valves.

Referring to the weir tank, it has a cast iron weir frame, which is set in the wall dividing the weir tank from the suction tank. Weirs of the V-notch shape, and rectangular weirs of 18, 22, 24, 35 and 48-inch widths can be inserted in this frame. A ladder with a platform has been provided to allow the test operator to descend and observe the levelling and careful setting of the weir crest to the zero mark of the float scale. Baffle plates in the weir tanks can be raised or lowered in wall frames to best advantage to check any disturbances of the water and to ensure a quiet flow near the weir.

A table with the necessary electrical instruments to measure the electrical input, and engineer's desk and a fitter's bench complete the equipment.

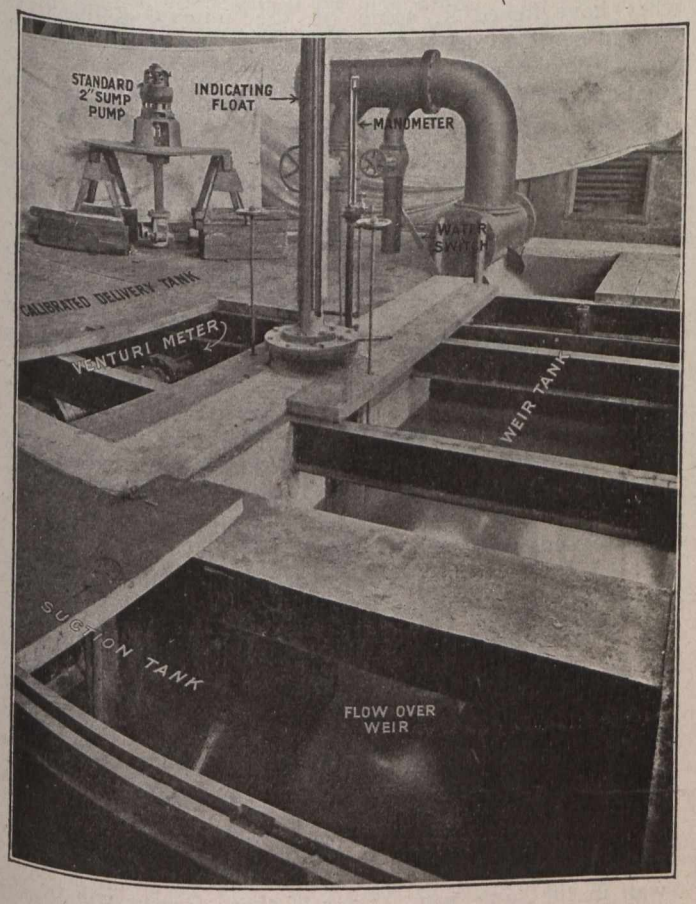

Fig. 2.

The method of test is as follows: All suction pipe connections are made with the above-mentioned pipes in the suction tank. The discharge connection is made with one of the two elbows, according to the size of pumps to be tested, and the water is discharged direct into the water switch. By operating the hand lever the water can be instantaneously switched either into the calibrated delivery tank, or into the weir flume. As the name indicates, the delivery tank, although of uniform section, has been carefully calibrated by weighing the water and noting the rise of level on the float scale. Assume the operator by means of the water switch has directed the flow into the weir flume. He observes the weir flume scale on the float and the manometer reading at the same time, thus checking the weir against the Venturi meter. Now the float is closed to the weir tank and opened to the delivery tank. The level of the water in the delivery tank having been observed and, with stopwatch in hand, the water switch lever is thrown over, allowing the water to fill up the delivery tank.

The operator allows the pump to discharge into the delivery tank for from, say, one minute in the case of 10,000 gal. per min. pumps to even half an hour if required for 500,000 gal. per min. pumps and noting the time, switches the discharge from the pump back into the weir flume whence it continues to circulate round. At his leisure and when the water in the delivery tank is quite still, the operator observes the new level and, subtracting it from the original level, arrives at an exact volumetric measurement of the water passing through the pump. Note here, also, that the water is still passing through the Venturi meters, thus checking them against the delivery tank. Thus the Venturi meter checks the weirs and the volumetric measurement checks the Venturi meter.

For any quantities over 10,000 gal. per min. the discharge is delivered direct into the delivery tank through bypass into the weir flume and over the largest weir which, having been checked up to 10,000 gal. per min., may reasonably be assumed to be exact for larger quantities.

It may also be mentioned here that steam inlet and exhaust pipe connections are available at the test plant and small or large steam turbine-driven pumps can be easily tested as motor or belt-driven units.

HYDROGRAPHIC SURVEYS IN ONTARIO.

THE stream measurement work developed in 1912 by the Ontario Hydro-Electric Power Commission was carried on continuously in 1913 with satisfactory results in the case of some rivers, and the reverse in others. The relation between gauge height and discharge was disturbed in nearly every case by ice conditions, as was to be expected. In the case of the rivers in the southwestern peninsula, such as the Grand, Maitland, Saugeen, Thames, Credit, and Nottawasaga, measurable velocities could in general only be obtained at wide shallow sections, where a high degree of accuracy in measurement could not be depended upon. The large number of mill-dams located in these streams also made it impossible to locate all gauges where they would not be affected by back-water at high stages of flow. This trouble has not yet manifested itself at the stations established on the Grand River during 1913, but it is to be expected during periods of high water.

In the case of the northern rivers, the above conditions were aggravated in many instances by the necessity of locating stations at accessible points. This usually meant the use of a bridge station, and in the case of the Sturgeon, Maganetawan, Wahnapitae, Spanish and Seguin Rivers, backwater trouble occurs intermittently owing to the operation of dams in connection with power development. The Mississaga station is seriously affected by wind levels on Lake Huron.

In the case of the Thames, Saugeen, South, Sturgeon and Credit rivers it has been found that by eliminating measurements where backwater effects are plainly evident, a fairly good station rating curve is obtainable. An effort will be made to re-locate the gauges at some of these stations so as to produce still better results.