A location was chosen at the last baffle in the mixing channel, and a 10-ft. rectangular weir was placed at this point, having its crest 9 ins. above the level of the sewage in the tanks, and 1 in. above the top of the baffle. By placing the weir at this location and height, no change was made in the conditions at the mouth of the 88-in. conduit leading from the pumps. At a point 12 ft. upstream a 3-in. pipe was built into the wall of the channel, 3 ins. lower than the crest of the weir. This pipe was carried into a large manhole, and another pipe was laid from the manhole to a 12-in. standpipe. The large amount of water in the manhole prevented the making of a wide line on the chart, due to momentary fluctuations in height.

The weir was then calibrated by experiment, the flow being measured in the various tanks of the plant, while observations were made of the height at the weir.

The recording instrument selected was the weir-gauge made by the Hydro Manufacturing Company of Philadelphia. This instrument was intended to record height directly, and in order to get a record in terms of volume, the usual device was employed, of introducing, between

Fig. 3.

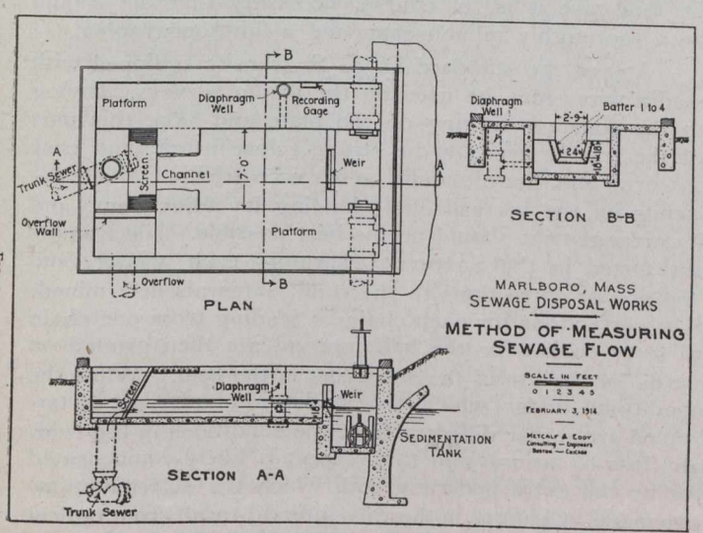

Fig. 3.—Arrangement of Apparatus in Use at Marlboro, Mass.

the float and the recording pen, a cam or spiral which should be designed according to the formula for this weir. An 8-in. float was placed in the standpipe, and connected by a cord to a counter-weighted drum, having a diameter of 5 ins.

On one end of this drum was fastened a sheet-iron disk, 30 ins. in diameter, and on the surface of this disk, raised on blocks ½ in. high, was placed a brass track, whose curve was such that the distance from the centre increased one-tenth of an inch for each million-gallon increase in the rate of flow.

On this track was made to travel a small wheel, whose axle was attached to the lower end of a vertical rod, on the upper end of which was fastened the pen-carriage of the recording device.

The drainage of Cobalt Lake has been completed, and mining operations beneath the lake bed can now proceed. This drainage project and the manner of supplying the concentrating mills with water from other sources was fully described in *The Canadian Engineer* in the issue of May 20th, 1915.

STADIA SURVEYS.*

By Rupert Neelands, D.L.S.

IN the first subdivision of the western townships, lakes smaller than twenty acres were not traversed, and marshy lakes with a shore line subject to variations of ten chains or more were dealt with by showing the legal subdivisions rendered worthless for farming.

Many changes in the size and character of the lakes in the West occurred from year to year, due to periodic variations in the climate, the cultivation of the ground, the clearing off of bush, and the diversion of the flow of springs and creeks. Many so-called lakes were merely shallow depressions filled with surface water, and these dried up wholly or in part. Others increased in size and depth, lakes of two hundred acres and upwards being found where at the time of the original survey there were only a few small ponds. In other lakes an increase in area due to the attrition of the bank was accompanied by a corresponding decrease in depth. In some cases marshy sloughs became small lakes, and open lakes became hay marshes.

As the land grew more valuable and the rate of taxation increased, many complaints were made by settlers who, having from five to fifty acres of water on their homesteads, were taxed for the full one hundred and sixty acres shown in their patent. Others desired to secure patents to land formed by the drying up of lakes, or to land formerly shown as being included in marshes worthless for farming. As patents were secured and sales of land became common, the presence of a body or bodies of water of unknown area hindered the sale of the land on which they were located.

To ascertain the area of these hitherto unsurveyed lakes, to revise former surveys where there had been a change in the outlines of the lakes or rivers, or in the character of the lakes, and to obtain this information quickly and at a moderate cost, is the purpose of the stadia surveys now in their second season.

The extent of the work of the stadia surveyors is a complete investigation of all bodies of water in the township. All rivers of one chain in width and upwards, all permanent lakes of five acres in area and upwards, and all islands are surveyed. All sloughs, marshes, bogs and muskegs are investigated, reported on, and, if necessary, surveyed. When in such investigation it is found that a section or quarter-section corner formerly left unmarked because of water, is now on dry land, the proper monument is erected at such corner and the witness monument, if any, is destroyed. A chain is used in measuring distances instead of a stadia rod in any resurveys necessary in this connection. The general condition of the monuments in the township is investigated and reported on, and if a resurvey is considered necessary, a petition for it is circulated among the settlers for their signatures if such resurvey is desired by them. Observations are taken in each township for magnetic declination.

Any changes or inaccuracies in the topography of the township, as shown on the original township plan, such as the correctness of the descriptive note, the diversion or disuse of old trails or the drying up or diversion of creeks are noted for correction. The pro-

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*From a paper read at the annual meeting in January, 1915, of the Dominion Land Surveyors' Association, Ottawa, Ont.