

and the south-west side of the Gulf of St. Lawrence. On this account it was deemed advisable to make sufficient expenditure upon it, to put it in thorough condition for the future. The crib-work was rebuilt of hardwood and the irregular angles between it and the rock were filled with cement to hold it in position. The iron cylinder was partially renewed. The difficulty with the chokage of the tide pipes had been largely due to material falling from the cliff above; a friable micaceous rock which is ground up rapidly into sand. The trouble was ultimately overcome by carrying the inlet of the tide pipes in the opposite direction, by brass piping, into a narrow gully which is always kept clean by the scour of the waves. Careful instructions were drawn up, and all the necessary fittings were designed or procured for these repairs; which were carried out during July by Captain Douglas, R. N. R., with the co-operation of Mr. S. C. Campbell, the superintendent of the island. The diploidoscope which furnishes correct time, was carefully adjusted to the meridian; and the plane of reference for the height of the tide was re-established by instrumental levels from the Bench-marks already placed for the purpose. The work was inspected by myself at the beginning of August, when the final adjustments were made.

At Forteau bay in Belle Isle strait the tide gauge required considerable improvement. A sheathing of hardwood, four inches thick, was placed on the two most exposed sides of the crib-work and secured by heavy angle-irons at the corners. The iron cylinder had settled over to an inclination of one in twelve from the vertical; and in straightening it up, it was necessary to alter the positions of both gauges inside the tide house, and to refit the sight-gauge. Every thing was put in thorough repair and the various instruments were also adjusted, as at St. Paul island.

Types of Sight Gauge.—In the sight-gauge at Forteau bay, wooden rods are used for the connection between the graduated staff and the float. These rods are an inch in diameter, and are made of basswood for lightness. Their length is seven feet, and they are varnished to prevent them from absorbing moisture, as this would increase their weight and depress the float. The total length of the sight-gauge was carefully set at 16.00 feet in September, 1900; and in August, 1902, its length was found by accurate measurement to be 15.99 which proves this type of sight-gauge to be perfectly reliable. It is the most satisfactory arrangement when the distance between the staff and float is not too great to preclude its use. Where this distance is greater, as at St. Paul island, where it amounts to twenty-four feet, nickel wire made into long links has proved to be the most satisfactory connection. These results are mentioned because of the great difficulty in finding any material for this connection, which would withstand sea-water and maintain its length unaffected by the heating lamps in winter.

FIELD WORK IN THE SEASON OF 1902.

In arranging the work of the season the first consideration had to be given to the principal stations; as St. Paul island was partially wrecked and required reconstruction; the gauge in Belle Isle strait was not in a satisfactory condition; and there were difficulties at Halifax and St. John which demanded attention. Careful preparation was needed for this work, especially for the isolated places; as most of the fittings and iron-work had to be specially made. Also, with a view to the reconstruction of the tide-gauge at Father Point when the new wharf there is completed, two lengths of old boiler were secured for the tide column and stored there in readiness.

The gauges at St. John and Halifax were visited in May, and the difficulties adjusted or noted for further investigation. From June 20 to July 23 the four summer tidal stations at the southern end of Nova Scotia, between Shelburne and Yarmouth, were erected and the observations commenced. My assistant Mr. S. C. Hayden, was then left in charge of these, with headquarters at Clarke harbour; and in August and September the tidal stations at St. Paul island, Trepassy bay at the eastern end of Newfoundland, and in Belle Isle strait, were visited and put in order as explained above; and on the way, the instrumental levels required were taken at Yarmouth, Digby and Halifax. Clarke harbour was again reached on September 27 after

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