

graphic office, formerly at Halifax. For these purposes a sum of \$2,000 was made available; and out of this amount a sum of \$1,554.96 was expended on the above objects.

The proposed observations were made by Lieut. Gordon at two points on the Atlantic coast of Nova Scotia; the object in view being to check the accuracy of the tidal differences between Halifax and other points along the coast, in order to make Halifax if possible a 'port of reference' for the whole eastern coast of Nova Scotia from Sestari Island to Cape Sable. This was the most important thing to do first, because of the hope that the records above referred to might prove a sufficient basis from which to compute tide tables for Halifax, which might serve in the meantime until a longer series of observations could be obtained. A further object in these preliminary observations, was to ascertain by the use of different appliances and methods, those which promised to give the best and most economical results. The details of this work and the descriptions of the appliances used are given in Appendix No. 16 to 23rd Annual Report, Department of Marine and Fisheries for 1890.

To ascertain the best form of tide gauge to employ, the most careful and exhaustive inquiries were made by the Minister, aided by the advice of Mr. Carpmæl, Director of the Meteorological Service. The difficulties in the case were exceptional, as at most points any ordinary apparatus is liable to freeze up in winter, and so to interrupt the record; and further, on grounds of economy, it was considered impossible to employ skilled observers for this special work, at the requisite number of stations.

The tides themselves on the coasts of Canada, vary so very much in their amount (from a height of four or five feet in the open Atlantic, to twelve and eighteen in the St. Lawrence River, and thirty feet and over in the Bay of Fundy) that a relatively large number of stations are required in order to follow their movements in any satisfactory way. In these circumstances a self-recording tide gauge, which will do the work of making the record of the tide day and night, with the least amount of supervision, is the most suitable and economical to use. To prevent freezing, and so to secure the record in winter as well as in summer, Mr. Carpmæl made special inquiries and experiments which are referred to in his report of December, 1890. (Appendix No. 16 to Annual Report, Department of Marine, 1890.) In making choice of the best form of tide gauge, Professor G. H. Darwin, of Cambridge, the most eminent specialist on tidal questions, was consulted. He kindly gave his advice in the matter; with a view also to the reduction of the observations, and calculation of tide tables from them. The gauge finally decided upon was the one devised by Sir William Thomson, and three of these were accordingly purchased to begin with.

The records of the Halifax tides above mentioned were submitted to Mr. Edward Roberts, of the Nautical Almanac office. Although there were breaks and imperfections in the record, he devised a special method of double computation by which these could be successfully overcome; and he was therefore able to report favourably upon them, and to recommend that tide tables should be computed from them. In making the calculations of these tides an ingenious and expensive computing machine was placed at the service of this department for a merely nominal fee. This machine was devised to facilitate the extensive tidal calculations made by the government of India. In this way tide tables were prepared for Halifax, first