

The observations should include the density and the temperature of the water, as well as the direction of the currents. The density is chiefly useful as an indication of its admixture with fresh water, either in the estuary or in the neighbourhood of melting icebergs. The temperature has always been found a valuable guide in tracing currents. In some situations it will be advisable to determine the under-currents also. The speed of the surface currents themselves, I propose to determine at a uniform depth of 10 feet, as this may be taken in general as half the average draught of a vessel. The speed, at this depth, will best show the movement of the body of the surface water, in relation to its effect in drifting a vessel.

In the coming season, I would recommend, as the most effective way to commence the work, that surveys be made of the two main entrances to the Gulf at Belle Isle, and at Cabot Strait between Cape Breton and Newfoundland, in order to determine the amount and direction of the currents that may be found to pass through these dominant openings. To do this work satisfactorily, observations should be carried on simultaneously at the two places, and should be continued for about three months, in order to secure the truly normal conditions of the currents, the effect of the difference between the spring and neap tides, and the disturbing effect of such exceptional conditions as may occur during that time. The under currents should be determined as well as the surface currents, so that the total amount of water which enters or leaves the Gulf area by these openings may be ascertained. The volume discharged by the St. Lawrence may also be taken into account, although a very slight movement of the waters at these large openings would more than make up for it. In this way some general basis will be obtained for the survey of the currents in the interior of the Gulf.

The sum required to carry out this work during the fiscal year 1894-1895 is shown in the estimate which I beg to append below; and I believe that to carry out the work as outlined and estimated in this report, is the most efficient and economical way of carrying on this Survey from the position it has already reached.

#### COMPLETION OF THE SURVEY.

The time required for the survey of the currents on both the Atlantic and Pacific coasts will be about six or eight years; on the basis of an annual expenditure as indicated, and the average annual cost should be fully covered by the amount of the present estimate; with the exception of the sum allowed for the use of the steamer, which in future years should be available for the full season. With this proviso, it will be possible in the time stated to survey the currents in the open waters traversed by the ocean-going vessels, and on the main routes leading to our principal harbours; but it does not contemplate an examination in detail of the currents in the less important bays and straits. The amount of the estimate also includes the additional tide gauges to be established in the first two seasons in advance of the survey of the currents in each region. The margin corresponding to this in later years can be used to carry forward the tidal work, until the completion of the survey of the currents; when the remaining tidal work can be completed satisfactorily on the basis of a much reduced expenditure.

#### SUMMARY.

The following summary may be given in conclusion, with special reference to the work for the coming season:—

1. The representations made in past years have shown the imperative need of obtaining full information as to the tides and currents in Canadian waters; and this is now generally admitted and recognized.

2. A practical commencement has been made by the erection of five tide gauges now in operation, and also by the publication of tide tables for the port of Halifax by this department.