

SURVEY OF CURRENTS.

The information obtained by means of the survey should be classed and described as (1) normal conditions, and (2) exceptional conditions and disturbing influences. The normal conditions of the Gulf of St. Lawrence during the season of navigation, are a fairly steady barometer and prevailing wind from the south-west; and some of the exceptional conditions already described may be taken as examples of disturbing influences.

Under the normal conditions then, the leading causes which produce the currents are the tides themselves and the force of the prevailing wind. It is therefore necessary that the winds and tides should be observed throughout the time that the survey of the currents is in progress. In recording the winds Mr. Carpmeal will be glad to co-operate by equipping more fully any of the present observatories where this may be necessary. This survey will also afford another direction in which the numerous meteorological observations now taken, may be utilized for the practical advantage of seamen. When all the tidal stations which I have indicated are established, there will be five in the Gulf and Lower St. Lawrence without counting Quebec. These must be maintained while the survey of the current is being made, to furnish the tidal data required; and during that time it may also be possible to establish some of the tidal differences between the present stations with sufficient accuracy to enable one or more of the tide gauges to be removed and utilized at new positions. It is therefore most advantageous in the interests of the work as a whole, that the survey of the currents should be commenced at once. It will also prove more economical in the long run to do so; and there is the further practical advantage of obtaining as soon as possible information which is so much needed. I would therefore recommend that this branch of the work be commenced this season.

The records made by the tide gauges now in operation have already accumulated to some extent; and it is only at present that a beginning is being made in the direction of working up the results. With the commencement of the survey of the currents, the staff at work in the summer season, could be utilized in the winter months to work up the tidal observations of the whole year. This affords a further reason in favour of carrying on the two branches of the work together.

METHODS AND APPLIANCES.

With regard to methods and appliances, it will only be necessary at present to make a few general remarks. Marine surveys have received a great stimulus in recent years from the "Challenger" expedition fitted out by the British Admiralty and from the investigations of the Gulf Stream by the "Blake" in connection with the United States Coast Survey. Much progress has thus been made in the appliances used; the use of the drift buoy for the measurement of currents has been largely superseded by the current-meter, although in some cases the older methods can still be used to advantage. The appliances devised for the "Blake" have made it practicable to anchor in depths ranging from 2,000 to 3,000 fathoms. It is of the greatest advantage to work from a vessel at anchor, as it affords a fixed point from which to determine the direction and velocity of the currents. This is especially important where the land is too distant to determine the direction and speed of a current by the drift of the vessel itself; and such determinations from drifting are in any case complicated with lee-way from the wind. The depths in the Gulf are not so formidable as those encountered by the "Blake," as they nowhere exceed 300 fathoms. For the survey of currents the use of a sailing vessel is found to be impracticable on account of the long delay in arriving at the spot where the observations are required and the impossibility of doing so in a calm, which is the very time when the observations would be the most accurate, the long time required to heave up the anchor by a hand windlass, and the danger to the vessel during this delay, if bad weather is the cause of departure. For these reasons it is necessary to have a steamer with steam winches, &c., which a few additional appliances would prepare for anchoring.