

at St. John. It is hoped that the comparison which will now be available between simultaneously observed tides at the two places, will give a more satisfactory result.

At all the four stations in the lower part of the bay, the whole tide to low water was obtained; except at Westport where the end of the wharf dries at the lowest of the spring tides.

*Tidal Conditions in the upper part of the Bay.*—In the Bay of Fundy above St. John, after personal examination and careful inquiry, there were no wharves to be found which extend to low water; nor were there any cliffs rising out of the deep water to which a tide gauge can be attached, except at one point which is several miles distant from the nearest house. To obtain a record of low water would therefore require special arrangement, and more outlay than can at present be met by this survey. The value of obtaining low water is also of less importance in this region than it usually is elsewhere, if the question of navigation is alone considered; as steamboats have to time their arrival for high water, and leave before the tide falls; while sailing vessels which are mostly of the smaller sizes, can lie conveniently on the bottom alongside the wharves to unload. It is for this reason that so little endeavour is made to extend wharves to low water. Instead of lying afloat and rising 30 or 40 feet against the side of a wharf, a vessel runs in at high water as far as its draught will allow, and lies aground during the greater part of the tide, with little change in its level, which much facilitates unloading. The bottom throughout the upper arms of the bay, below the first few inches of soft red mud, has the consistency of stiff clay and is almost devoid of stones, which much favours this practice. Where there are any local difficulties, a bench or stage of mattress-work is placed in front of the wharf, for vessels to lie on, while the tide is out.

In these conditions, it is the time of high water which is of primary importance to navigation; and next to this, the period of time during which the tide remains sufficiently high to give floatation for a vessel of moderate draught. These data can be deduced from a tidal record which gives the upper half of the tide only.

On the other hand, the form of the complete tide curve is not obtained, nor the data for mean sea level; and the time of low water can only be obtained roughly between the upper parts of the tide as registered.

To obtain a complete record of the tide with a self-registering instrument, it is necessary to have the whole tide rising and falling in one vertical column. In a region where the range of the tide is from 40 to 50 feet, special construction for the tide gauge would be required. If readings on a graduated staff were sufficient, it would not be necessary to have the whole height at one point. One staff could be set at low water mark with a height of some 12 feet, and another further up the slope of the beach, and so on in succession. The cost of taking observations by this method would be several times greater than with a self-registering instrument, and the information obtained would be less than half, as the night tides would be lost.

The wharves, which extend to about half-tide, are already long; and the tide recedes nearly quarter of a mile beyond their end, exposing wide mud flats. In these circumstances the choice seems to lie between the following alternatives: To build an erection of some 50 feet in height at low water mark, to support a vertical pipe which would serve as a tide column for the gauge. Such an erection would need to be substantially braced to withstand the strong tidal currents; and it would have to carry a light, as a warning to shipping. The other alternative would be to take advantage of existing wharves to get as far out as possible; and to sink a tide-well at the end of the wharf, in which the tide would rise and fall by means of a siphon connection, extending to low water. For this siphon to work satisfactorily, the well should not be more than 20 or 25 feet deep, taking up that height at the lower part of the range of the tide. The siphon pipe should also be large relatively to the tide-well; as the rate of rise and fall is as much as eight feet per hour. The chief difficulty arises from the excessively muddy character of the water, which would soon choke up the pipes, unless special provision were made for cleaning them out.

This method of siphoning was tried at Moncton with success; although the height siphoned was only nine feet. The difficulty there was to make arrangement to enable the siphon to work inwards, and fill the tide-well during the rapid rise after the arrival of

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