

complicated by the inter-relations of the various changes that had taken place; but technical difficulties need not be explained here, though it may be in place to remark that trouble of this character is always likely to arise when the tide gauges have to be placed on crib-work or other timber-work, which is liable to displacement or settlement. When they have to be so built, owing to the want of masonry on which to set them, the closest watchfulness is necessary; and instrumental levels have to be repeated at frequent intervals, with check calculations in the office. Otherwise a uniform datum level, which is essential for the observations, cannot be maintained.

As a precautionary measure, to enable any settlement to be detected more readily, a bronze bolt was let into a vertical face of rock at about half tide. This rock forms a reef in the vicinity of the gauge, which is covered at high water. The reading on the wharf scale when the water is at the level of this bolt, is posted up in the tide-house for reference. An improvement in the sight-gauge has also been made by using wooden rods for the connection between its scale and the float which rises and falls with the tide. This is to avoid the possibility of alteration in its length; and it has now been carefully adjusted to standard length. Several other minor improvements were also made.

At St. Paul island similar difficulty has been met with, in maintaining a uniform datum level. A scale of feet was originally cut on the face of the rock for reference; but this has been effaced by the heavy ice of winter. It is seldom in any case that there is not too heavy a swell to obtain satisfactory readings on such a scale. Entire dependence has therefore to be placed on the sight-gauge, to furnish the datum level. The tide-house had to be raised twenty-four feet above high water, to prevent it from being carried away in winter storms; and this makes the length of the sight-gauge too great to use wooden rods for the connection between its scale and the tide-float. For this connection, heavy nickel wire, made up into chain of 6-inch links, has now been adopted. This gives every promise of success; as it had already proved satisfactory throughout the previous winter at the Halifax gauge.

The rock of which the cliffs are composed and against which the tide gauge is set, is so crumbling that reference marks for the levels are soon lost. A bronze bolt has therefore been drilled into the rock for this purpose; and by these improvements it is hoped that a uniform datum will be more certainly and conveniently maintained; and that the amount of office work required for the reduction of the observations to datum, will be appreciably decreased.

The diploidsopes, which give the correct time from the sun, were adjusted by astronomical observations at both Forteau bay and St. Paul island. The barographs, which give a continuous record of the height of the barometer, were also adjusted at both stations.

At Father Point, extended observations were taken in August to compare the actual rise and fall of the tide on the open beach, with the record given by the instrument; as this gauge works by siphoning through an inlet pipe nearly 400 feet long. Simultaneous comparisons were made every two or three minutes for several hours at a time, on fine days during the time of the spring tides. The results need not here be detailed. When compiled with the similar observations obtained the year before, they afford a table of correction to be applied to the height of the tide, to allow for the siphoning action of the gauge. This is essential in the reduction of the observations.

At Quebec, a favourable opportunity was taken to secure a further series of comparisons, to determine the relation between the zero of the tide gauge and the scale of feet cut on the masonry of the dry dock on which the gauge stands.

TIDAL RECORD OBTAINED AT THE PRINCIPAL STATIONS.

The record obtained has been practically continuous during the year, at the seven east coast stations, as well as at the two tidal stations in British Columbia. The causes of interruption may be cited briefly, as examples of the nature of the difficulties to be met, against which foresight is required.