

as actively engaged in its destruction, by fencing in, as it were, the whole smooth water basin they have made, and justify the inference that, if left entirely to themselves, will at some future period unite the Peninsula to the mainland west of the Queen's Wharf, in the same manner as it was originally connected by the ridge from near Privat's to the Wind-mill. This stage of the deposit is illustrated by Fig. 15, at which period the surplus water of the Don would in all probability find egress over the bar by a shallow channel, fluctuating in position as well as depth during every southerly gale, or by such gaps as are occasionally opened in the narrow belt of sand separating Ashbridge's Bay from the main Lake.

The progressive motion of the beach, observable only on close examination, and apparently of little moment, is when continued during incalculable periods of time, thus proved to be productive of very extraordinary results. Nor is it confined to this neighbourhood, for we discover unmistakable indications of its operations along the shores of all the great inland lakes.

Round Lake Ontario its effects can be traced at Burlington Beach, the mouth of the Niagara River, Presque Isle, Cobourg, Port Hope, Windsor Bay, and at innumerable points along the east and south boundaries of the Lake.

Round Lake Erie we see its results at Sandusky Bay, Point aux Pins, Long Point, Port Colborne, Buffalo, and at Erie.

At Saganaw Bay, Thunder Bay, Riviers Aux Sable, north and south, at Nottawasaga, and the Christian Islands, on Lake Huron.

Round Lake Superior we also have many examples of a like kind; at Fond du Lac, a gravel beach resembling in a marked degree, both in appearance and position, the Burlington beach near Hamilton. At the mouth of the Bad River, and at Point Iroquois, also, are found beach formations.

Many of these closely resemble in outline the Peninsula at Toronto. Some of them are kindred to the hypothetical stage denoted by Fig. 15; all of them are identical in geological character, and exemplify the workings of one of Nature's ever active agencies, co-existent and co-extensive with the lakes themselves. One fact which very strongly confirms the theory of the formation of the Peninsula here propounded, is worthy of notice: all the examples above mentioned invariably conform with the rule laid down—the trend of the deposits bearing in a direction opposite to the longest fetch of the waves, or the largest area of open water traversed. The entire absence of boulders is also very remarkable, and whenever gravel forms part of the drift, the largest sized is generally found nearest its source, the finest kinds being at the greatest distances. This circumstance is explained by Fig. 2, and the accompanying remarks, which show that small bodies are moved onwards with the greatest facility. Large boulders, in consequence of being able to resist the mechanical force of the waves remain at rest, and therefore can form no part of beach formations.

To arrive at a knowledge of those changes more particularly referred to, which have taken place on the shoal at the mouth of the harbour, I have with permission carefully examined the old maps and charts in the Surveyor-General and Ordnance Departments: many of them are wanting in detail, and in this respect of little service to the enquiry; others are of considerable value, the most reliable of which appear to be the charts of Bouchette, Bayfield, and Bonnycastle, dated respectively 1796, 1828, and 1835; for although they do not profess to much nicety of detail, yet emanating from these sources we have no

reason to doubt their general accuracy. Fig. 2 shows the position of the shoal at the several dates of these charts, and as it now exists; the soundings have reference to its present state. I have much to regret being as yet unsuccessful in procuring a copy of one very old chart, the possession of which would be invaluable, seeing that it is without doubt the earliest record of Toronto Harbour in existence. This chart is said to have been made by a corps of engineers who accompanied the first pioneers from France nearly 200 years ago. A copy, perhaps the only one on the Continent, was unfortunately destroyed with the Parliament Buildings in Montreal, in 1817: the original is supposed to be deposited in a Jesuit College in Paris.

On comparing the charts of Bouchette, Bayfield, and Bonnycastle, with my own from a recent survey, showing the state of the Peninsula at the present time, we obtain results as follows:—

First, that the channel between ten feet water lines was,

In 1796 about	480 yards wide.
" 1828 "	210 "
" 1835 "	260 "
" 1850 "	120 "

Second, that the quantity of sand deposited at the south side of the entrance by an approximate estimate is as follows:—

From 1796 to 1849—50 nearly 660,000 cubic yards, being in 53 years about 12,400 yards per annum.

From 1828 to 1849 nearly 235,000 cubic yards, being in 21 years about 11,200 yards per annum.

From 1835 to 1849 nearly 155,000 cubic yards, being in 14 years about 11,000 yards per annum.

The alarming progress of the shoal landward is from these figures very apparent. Fifty-three years ago the entrance is shown to have been four times its present width, and fourteen years ago more than double, thus decreasing at the rate of from seven to ten yards annually, by the deposit of about 11,000 cubic yards.

If such be the case, and it is founded on the most authentic information relative to the past condition of the Harbour as yet in our possession, we have substantial reasons for believing that if left unheeded it will in ten or twelve years be inaccessible except to the smallest craft.

The extension of the shoal may be attributed to the same causes which are proved to have formed the whole Peninsula. The beach sand having reached the Light-house point cannot by reason of the great depth of water, as shown by the contour lines, Fig. 14, make much progress in extending the Peninsula from thence westerly; there is therefore nothing or at least not much to prevent the southerly waves from acting in full play, they having a fetch of forty miles in opposition to the northerly immediately off the land, and washing along the bar (scarcely under water) towards the north "dump," as it were periodically, large quantities of sand into the channel.

Certain outward and inward currents occasionally exist at the entrance, caused probably by gales slightly varying the level of portions of the lake, or, as it is also supposed, by local variations of the atmospheric pressure on its surface; these may assist to a limited extent in prolonging the existence of the channel, but from all the observations I have as yet been able to make, they appear to be surface currents only, having little or no appreciable effect five or six feet under water; even this supposition therefore is very problematical.