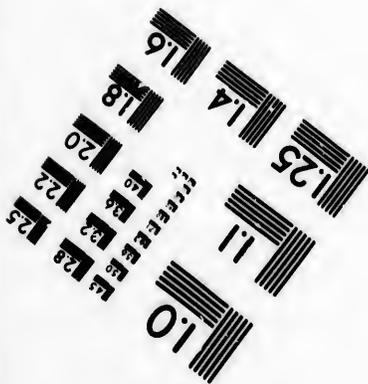
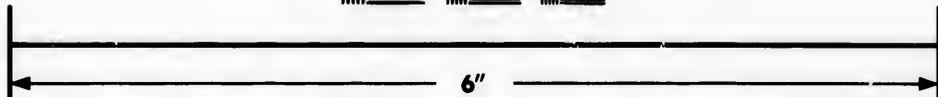
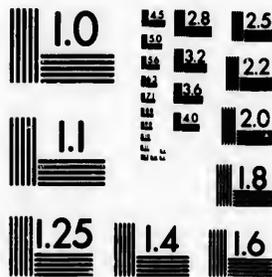


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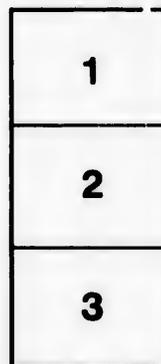
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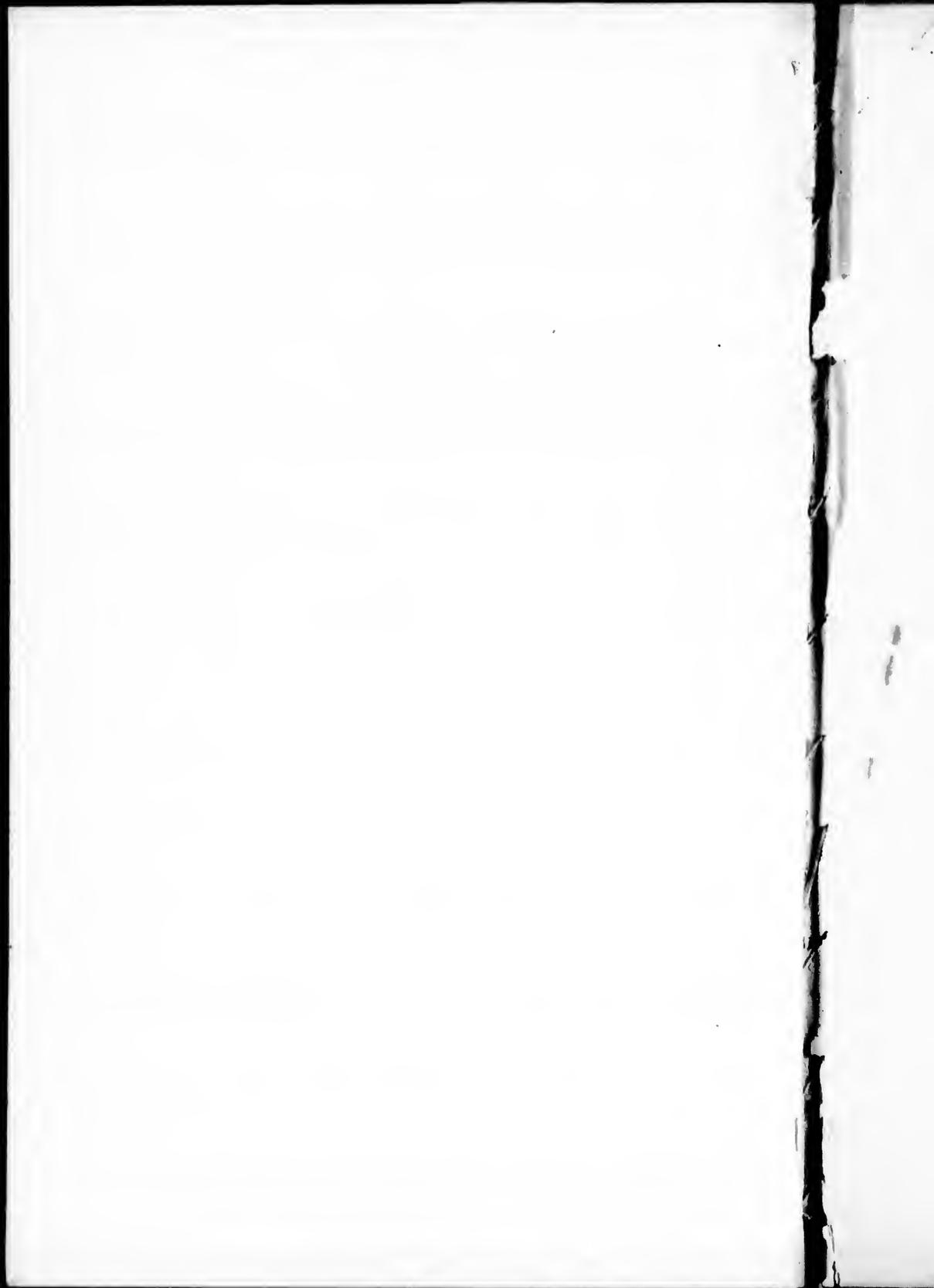
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THE  
INLAND SEAS OF NORTH AMERICA;  
AND THE  
NATURAL AND INDUSTRIAL  
PRODUCTIONS OF CANADA,

WITH THE REAL FOUNDATIONS FOR ITS FUTURE PROSPERITY.

BY THE REV. JAMES WILLIAMSON, A. M.,  
PROFESSOR OF MATHEMATICS AND NATURAL PHILOSOPHY, UNIVERSITY  
OF QUEEN'S COLLEGE.

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KINGSTON:

JOHN DUFF.

MONTREAL: HEW RAMSAY; TORONTO: A. H. ARMOUR AND CO.

1854.

The first of these Lectures, which were delivered for the benefit of the Commercial Reading Room, though written after consideration and enquiry, was not intended for the press. But the Committee, and others, having expressed a desire for the publication of both, the writer has much pleasure in complying with their wishes.

KINGSTON. May, 1854.

## THE INLAND SEAS OF NORTH AMERICA.

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THE size, and multitude, of its lakes are the peculiar features of North America. Other continents have higher mountains, and even rivers discharging a much greater volume of water; but North America is emphatically the region of lakes. They are most frequent in the north of the continent, in the northern part of the United States, in Canada, and in the Hudson's Bay Territory, where they are almost literally innumerable, and in some measure supply the want of a great northern sea, and temper the climate to a very considerable extent, in the same latitudes, in which, in Siberia, which is comparatively destitute of lakes, the cold is far more intense, than in North America. But, among these lakes, there are five, distinguished at once by their great size, their mutual connection, and vicinity to one another, and their more important position, Lakes Superior, Huron, Michigan, Erie and Ontario, which claim our special notice; and are, at the same time, most interesting to us, forming as they do the greater part of the boundary of Canada West, and the means of its communication with the ocean through the St. Lawrence, of which they may be viewed as the expansions. These lakes, traversed as they are by large vessels, and with their rolling waves, and distant horizon, may well be termed "inland seas," have an area of nearly 100,000 square miles, and contain upwards of 11,000 cubic miles of water, or much more than half the fresh water in all the lakes of the world. Lake Superior alone is by far the largest fresh water lake on our globe, and,

although singly surpassed in magnitude by the Caspian, the waters of which are salt, the Caspian has no outlet, while Lake Superior, with undiminished volume, discharges its surplus waters by a mighty river.

Up to 1678 only the Indian canoe had skimmed the surface of the great Lakes, and their names therefore are all of Indian origin except the name of Lake Superior, which it received from the French. Although the river St. Lawrence had been entered and explored, as far as the Cedar Rapids, by Jacques Cartier so early as in the years 1534, 1535, and 1541, and finally by Champlain, by whom the first permanent settlement in Canada was formed at Quebec in 1608, the first record of the shores of any of the lakes having been trodden by the foot of Europeans is the account of Champlain's visit to Lake Huron from Montreal by the route of the Ottawa, in 1615. Little however was known about them for years afterwards, during which the infant colony of New France was scarcely more than struggling for existence. At length the adventurous white man ascended the St. Lawrence, passed its foaming rapids, and penetrated through the trackless forests to Lakes Ontario and Erie. In 1654 the Jesuit father Le Moine made the first settlement in the vicinity of Lake Ontario, which was then called by the French "the Lake of the Iroquois," by founding a mission house at Onondago, near the present town of Syracuse, on the south side of the lake, and, in 1667, Father Perrot penetrated to Lake Superior. In 1671 Sieur Soissons met the assembled deputies of the Indian tribes at the Sault St. Mary. In 1673, Fort Frontenac was erected on the site of the present Tête du Pont Barracks at Kingston, and about the same time trading posts were established at Detroit, Mackinaw and Niagara. In 1678, a vessel of 16 tons was

launched on Lake Ontario by La Salle, and in 1679 another of 60 tons was launched on Lake Eric, under the superintendence of the same enterprising Frenchman, the first precursors of those fleets by which their waves are now ploughed in every direction.

The Lakes, from this period began to be somewhat better known, but it appears, from the statements of Charlevoix, that things continued nearly in this position in 1720 and 1721, the French being hardly able to maintain their posts at these scattered points against the hostile tribes of Indians, that there was little or no cultivation in their neighbourhood, and that, above Montreal, there was nothing that could be called a colony, and, even down to 1783, when the settlement of the U. E. Loyalists took place, there was scarcely any settlement on the north side of the lakes, with the exception of a few French on the St. Clair and Detroit Rivers, and the Indians. The acquaintance with the great lakes on the south, and then British side of the shore, was still more recent. The first trading post of the British was at Oswego, and was not established until 1722. In 1791, on the northern sides of the lakes, there were only 3000, or 4000 inhabitants of European descent, and the country on their shores was almost an unbroken solitude. The mail from Quebec reached the few settlers at the upper end of Lake Ontario only once in six months. On the southern shore the inhabitants were scarcely more numerous, and the scene was essentially the same.

Such was the state of things in the country around the lakes sixty years ago. But while the general features of nature which the lakes present, remain almost the same, as they have been for ages, they have changed, even within the brief

space of half a century, in everything else,—their banks studded with rising cities and towns, each with an ever increasing population of thousands of busy inhabitants, and their surface traversed in every direction by steamers of the largest size, furnished with almost every thing that commerce and elegance seem to require, and by the stately ship, laden with the burden of a commerce which grows with a rapidity unexampled in the history of the world. A change so great, and astonishing, in so short an interval, may well awaken our interest, but the very briefness of the period during which it has taken place renders the attempt at an accurate description of the lakes, and the consideration in a satisfactory manner of the subjects connected with them, or which they suggest, the more difficult. It is well known, that, in the various geographical notices of the lake region, some of them published but a few years ago, we often meet with statements which are glaringly incorrect; and it is only lately, that even the heights of the several lakes above the level of the sea, and above each other, have been determined with much exactness, that either the annual temperatures, or the different magnetic means and variations, and other meteorological characteristics of any points on their shores, or the geological structure of the surrounding country, have been ascertained with any degree of precision; and no work on the lakes has yet appeared, presenting in one view even those authentic results which have already been obtained, to lessen the labour of research. On many points, also, such as the changes in the level of the lakes, their depth, the zoology of their waters and of the adjoining land, the botany of their different regions, and the statistics of their commerce, although much has been done to supply such deficiencies by various Provincial Reports,

and especially by the State Reports of the opposite Republic, our information is far from complete. The field, indeed, is so extensive, and the variety of particulars to be ascertained is so great, and requiring such combined and sustained investigation in different localities, and in the different departments of enquiry, that it cannot be expected that it should be otherwise. With these remarks, we shall now endeavour to give as complete, a sketch of our subject up to the present time as the present state of our information, and the limits of a single lecture, will permit.

North America may be divided into seven great basins, with reference to the direction of its rivers,—the Atlantic basin, between the Alleghanies and that ocean, the Pacific between the Rocky Mountains and the Pacific, the Arctic within the Rocky Mountains on the west and the heights of land which separate it from the head waters of the St. Lawrence, and of those rivers which flow into Hudson's Bay, the basin of Hudson's Bay, the basin of the St. Lawrence, the basin of the Mississippi, and the basin of Mexico, and Central America, between the prolongation of the Rocky Mountains in those countries, and the Gulf of Mexico, and the Caribbean Sea.

The five great lakes, which we are now to consider, are situated within the basin of the St. Lawrence, and seem as it were the continuation of a long line of lakes, many others of which are also of great magnitude, extending in a direction from north-west to south-east, from not far from the mouth of the Mackenzie River to the Atlantic Ocean. The valley, or basin, of the St. Lawrence is divided into two parts by the rocky ridge which crosses it through the groupe of the Thousand Islands, and, in the upper portion, lie the five inland seas. This upper part, or sub-basin, is marked out

by boundaries which, though presenting no very striking feature, are yet sufficiently well defined. On the north, it is enclosed by the mountains from which flow the streams falling into Lakes Superior and Huron. Thence, on the N. E., it is bounded by the high lands separating it from the country unwatered by the Ottawa, and extending from Lake Nipissing to the townships of Tudor and Grimsthorpe, and round by Hinchinbrook to the summit level of the Rideau Canal. To the east, its limits are the Thousand Islands, the high grounds in which are the sources of the Black River and its tributaries, and of the Oneida; and to the south, the heights from which descend the Seneca and Genesee Rivers, in the State of New York, (one half of the waters of which State flow into Lake Ontario alone;) and farther westward, the ridge separating the streams falling into the other lakes from the Alleghany and Ohio, the Illinois, the Wisconsin, and other tributaries of the Mississippi.

Within the area thus bounded what are termed the "Great Lakes" are contained. Including the lakes, its extent is about 300,000 square miles, that of the great lakes themselves being not much less than 100,000, a surface larger than the whole of Great Britain.

These inland seas are not like the most of other great lakes. There are no mountain ranges, of any considerable altitude, at any part of the circumference of their basin, except on the north, and part of the south shore of Lake Superior, and the La Cloche Mountains, on the north of Lake Huron, none of which, however, rise to any great elevation. Indeed so low, in some places, and so small, is the breadth of the ridge which separates the Lakes from the head waters of the streams which flow from Rainy Lake, or the Lake of the Woods, through Lake Winnipeg, and

other large lakes into the Arctic Ocean, that in some geographical works, the source of the St. Lawrence has been traced through the Sackatchewan to the Rocky Mountains, thus making it the longest river in the world. This, indeed, is not the case, as there is a dividing ridge on the west of Lake Superior, between the waters which flow eastward, through the lakes, into the Atlantic, and those which flow towards the Northern Sea, though the distance between their sources is a comparatively short and easy one. But it is true, that various important tributaries of the Mississippi rise very near to the lakes, and in time of flood actually communicate with them. A branch of the Alleghany, one of the streams which by their junction form the Ohio, rises only a few miles from the edge of Lake Erie. The Kankakee, which with the Des Plaines forms the Illinois, rises in Indiana within two miles from the River St. Joseph, which falls into Lake Michigan, and in the wet season boats pass from the one to the other. The Des Plaines River again runs for some distance nearly parallel to the shore of Lake Michigan, not more than ten miles from the lake, and, in similar seasons, is connected with it, through the Chicago River, and loaded boats pass and re-pass from the one to the other.

The general aspect, therefore, of the area within which the lakes are comprised is that of a great central plain, with successive terraces, or plateaux. The bounding ridges are of small elevation, and the whole fall of the water of the lakes, in their course of 1300 miles, from the head of Lake Superior to the foot of Lake Ontario, is only 370 feet, or a little more than three inches in a mile. The land area, between these bounding ridges, and the lakes themselves is comparatively narrow and hence no large rivers flow into

them, although their tributary streams are very numerous.

The extreme point of the great Lakes situated within this area on the east is  $76^{\circ} 10'$  W. Long, on the east of Lake Ontario, at the mouth of the Black River, in Jefferson county, New York, and on the west, in  $92^{\circ} 20'$  W. Long. at Fond du lac, at the west end of Lake Superior, the distance between these two points, or the transverse axis of the lakes, being a little more than 16 degrees, or about 800 English miles, in a straight line. The extreme point on the South is in  $41^{\circ} 20'$ , N. Lat., on Lake Erie, a little to the East of Sandusky city, and, on the north in  $49^{\circ}$  N. Lat., on the north of Lake Superior, at the mouth of the Neepigong River, the distance between the extreme north, and south points being thus,  $7^{\circ} 40'$ , or about 530 English miles.

The shores of the lakes themselves are bounded on the N., by Canada West, except a small portion of the North West extremity of Lake Superior, which is bordered on by Wisconsin, and, on the south by the states of New York, Pennsylvania, Ohio, Michigan, Indiana, Illinois, and Wisconsin, seven of the principal States, and containing nearly one half of the whole population of the union. The boundary between the British dominions, and the United States, runs through the middle of the Lakes throughout their whole course, extending from the middle of the South Channel of the St. Lawrence at Cape Vincent, north of the Galops Islands, through Lake Ontario up the Niagara River passing to the west of Grand Island, thence through Lake Erie between Pelée and Cunningham Islands up the Detroit river and St. Clair lake and river, through Lake Huron, between Cockburn, and Drummond Islands, south of St. Joseph, between Neebish and Sugar Islands, and up the St. Mary through Lake Superior, passing by the north of Isle Royale to Pigeon Bay.

Before proceeding to consider briefly each of the lakes in succession, we may advert in general, to their relative position and dimensions, and the course of their waters in their progress to the sea.

Lake Superior, at a height of  $599\frac{1}{2}$  feet above the sea, 420 miles long, 160 miles broad, and 1200 feet deep, discharges its waters by the River St. Mary, 39 miles long, into Lake Huron, which lies 21.41 feet below. Lake Huron, at a height of 578 feet above the sea, 250 miles long, 220 miles broad, and 900 feet deep, and Lake Michigan with the same height, and about the same depth of water, 310 miles long and 90 broad, overflows by the river, and lake St. Clair, and the Detroit river, in all about 80 miles long, with a fall of 13 feet into Lake Erie. This latter lake again, at an elevation above the sea of 565 feet, 260 miles long, 65 miles broad, and 270 feet at its greatest depth, but, on an average, considerably less than 100 feet deep, discharges its surplus waters by the Niagara river into Lake Ontario 334 feet below, 51 feet of this descent being in the rapids immediately above the Falls, 164 feet at the Falls themselves, and the rest chiefly in the rapids between the Falls and Queenston. Lake Ontario, the lowest of the Lakes, is 231 feet above tide water at Three Rivers, and is 200 miles long, 60 broad, and 600 feet deep. Thus basin succeeds basin, like the locks of a great Canal. Of these lakes, Lake Superior has by far the largest area, being very nearly equal in superficial extent to Lakes Huron, and Michigan together, and Lake Ontario has the least, having a surface only one-fifth of that of Lake Superior, and being somewhat less in area than Lake Erie, although not much less, if any, in the circuit of its shores.

Lake Superior is about 1750 miles in circuit, with an area of 40,000 square miles. The borders of this lake are

generally bold, and rocky, especially on the north shore, where a range of low mountains rises from 500 to 1300 feet in height. The most remarkable elevations on the coast are the precipice of basalt of the Thunder mountain in Thunder Bay, on the north shore, immediately overhanging the lake, 1200 feet high, and the *pictured rocks*, as they are termed, on the south side of the lake towards its eastern extremity. The pictured rocks form a perpendicular face of crag, 300 feet high, and about 12 miles long, broken into the most fantastic forms, and worn out into caverns, resounding with the deafening roar of the waves which beat into them during the stormy weather which not unfrequently prevails in the lake. At one point of this great escarpement there is a fall of water, called the Cascade de Portaille, 70 feet high, which is precipitated so far into the lake, that a boat can pass between it, and the shore ; and, at another, four pillars of rock support a natural entablature of stone covered with soil, and crowned with pine and spruce trees, fifty feet in height. To this singular object has been given the name of the Doric Arch. The shores of Lake Superior, except in the scanty clearings of Michigan and Wisconsin on the south, and of the Hudson's Bay and Mining Companies on the north, are almost every where covered with the primeval forest. There is comparatively little arable land, particularly on the north, but a good deal of fertile soil, which yields abundance of hardy grains and vegetables, is to be found, especially in the valleys of the rivers. About 220 rivers flows into the lake, some of them nearly 200 miles in length, but none of them are of any great size. The islands of Lake Superior are chiefly on the northern coast, the largest of them being Isle Royale, 45 miles long, belonging to the United States, and St. Ignace to the British govern-

ment. The main body of the lake even in that cold climate, where the thermometer falls in winter to  $30^{\circ}$  below zero, is never frozen, the ice covering only the shores, and bays. The water however is generally very cold, even in summer, so that it is often as low as  $38^{\circ}$  in July, while it is  $80^{\circ}$  a little distance inland. The fogs on the coasts in summer are frequent, the warm air off the land having its vapour condensed by the cold of the lake.

The river St. Mary is the only outlet of Lake Superior into Lake Huron. Fifteen miles from Gros Cap, the entrance of Lake Superior, the navigation of the river is interrupted by a rapid three fourths of a mile long, with a fall of  $18\frac{1}{2}$  feet, which renders necessary a portage of about a mile, on the one side, to the American village of Sault Ste. Marie, and the Military post of Fort Brady, and, on the other, to a station of the Hudson's Bay Company, and an Indian village. This portage will, on the Americanside, be very soon superseded by a canal on a large scale. The fall from the foot of the St. Mary rapids to Lake Huron, 24 miles farther down is 2.91 of a foot. The scenery below the Sault on the north side of the river St. Mary, although the river itself has no magnificent fall like the Niagara, is much grander, and more picturesque, than in any of the other rivers which connect the great lakes with each other.

Having descended the St. Mary by a channel which is easily navigable for large vessels, except for about a mile and a half, in Great Lake Geerge, where it is from 150 to 500 feet broad, and has from 10 to 6 feet of water, according to the height of the water in the lake, and therefore requires careful pilotage, we reach Lake Huron. This lake is very irregular in form, and is divided into two parts by the chain of the Manitoulin Islands, which stretching from

opposite Cabot's Head, extend in a line nearly parallel to the north shore. The area of the south portion of the lake is about 14,000 square miles; that to the north is divided into two parts, known by the names of the Georgian Bay, and the North Channel, the former with an area of 6000, and the latter with a surface of 1700, thus making the area of the whole about 21,700 square miles. Saginaw Bay in Michigan, a branch of the lake, is about 60 miles long, and 32 miles broad. The shores, on the south, and other sides of the lake are generally low, and the water is comparatively shallow. But on the north, the shores, although not so bold as those of Lake Superior, are more elevated than on the south, rising into heights of from 400 to 700 feet, with deep water, and many good harbours. The land on the borders of Lake Huron, is generally fertile, except on the north, where it is often rocky, but even there much of it is capable of being profitably cultivated. The rivers which flow into it, besides the St. Mary, are exceedingly numerous, although none of them are very large, or of any great length of course. The Islands of Lake Huron are chiefly on the north shore, and are almost countless in number, many thousands of them studding the shores of the Georgian Bay. But by far the largest, and most important are the Manitoulines, an Indian name, denoting the abode of the Great Spirit, which properly comprize only the Great Manitoulin, Cockburn, Drummond, and Fitz William, or Horse Shoe Island, but may be taken generally as including the Island of St. Joseph, and La Cloche, and other smaller islands in the same natural groupe. The Great Manitoulin, which is 80 miles long with an average breadth of 20 miles, and a land area of 1600 square miles, is the most beautiful, and fertile island of Canada, and of the Lakes. Along with

Cockburn and Horse-Shoe Islands, it forms an Indian reserve, and contains none but Indian settlements. All of these islands, as well as the adjacent coast, on the south of the Georgian Bay have an abrupt escarpment on the north east, and a gentle slope to the south west.

Lake Michigan, the third great lake, is connected with Lake Huron, of which it is in reality only a part, by the straits of Mackinaw about four miles broad at their narrowest part, and so called from the island of Michillimackinac, or Mackinaw, important both from its natural position, and from its historical associations, which is situated near the entrance from Lake Huron into the Straits. Lake Michigan has a circuit of about a 1000 miles, and an area of nearly 17,000 square miles, exclusive of the branch of the lake called Green Bay 100 miles in length, and at an average 20 in breadth, and with an area of about 2000 miles, thus making the whole area of Lake Michigan about 19,000 square miles. The area of Lakes Huron, and Michigan, taken together is very nearly the same as that of Lake Superior.

The waters of Lake Huron, and Michigan, issue by the River St. Clair, 24 miles, Lake St. Clair 30 miles, and the Detroit River about 28 miles long, through a level, and rich country abounding in magnificent timber of the most valuable kinds. The Rivers St. Clair, and Detroit are easily navigable by large vessels, but the navigation of the Lake St. Clair is much impeded by flats.

Lake Erie, the fourth of the great lakes, is about 700 miles in circuit, with an area of about 11,000 square miles. Its shores are generally low, and shallow, like the lake itself. It has, therefore, few good harbours, and is often covered with floating ice until near the beginning of May. Its commercial position, however, is a favourable one, situated as it

is in one of the most fertile regions of North America, at the centre of the lake communication, and not far from the navigable tributaries of the Delaware, and the Mississippi. Notwithstanding, therefore, its disadvantages in other respects, compared with Lake Ontario, the increase in its commerce, and shipping, has hitherto been much more rapid, and decided, although the greatly augmented facilities of communication between Lake Ontario and the sea board, on the one hand, and with the Upper lakes, on the other, has already begun to turn, and will probably ere long turn, the scale in favor of Lake Ontario.

Lake Ontario, the last of the great lakes, is connected with Lake Erie by the Niagara river,  $33\frac{1}{2}$  miles long, forming in its course the falls of Niagara. Although its area, about 7000 square miles, is less than that of Lake Erie, the circuit of its shores, and bays, which are more varied, and irregular in their outline, particularly the Bay of Quintè, the scenery of which is among the finest in North America, is much greater, in proportion to its size, than that of the latter lake. And it has the advantage of greater depth of water, and better harbors, of which that of Kingston, on the Canadian side, and Sacketts Harbour, on the other, are the best. Lake Ontario, besides the waters of the upper lakes which it receives by the Niagara, is also fed by a number of smaller, yet somewhat considerable, streams, the principal of which are the Napanee, the Salmon, the Trent, Humber, and Credit on the north, and the Genesee, Oswego, and Black rivers on the south.

The St. Lawrence, formerly called in this part of its stream the River Iroquois, or the Cataraqui, forms, about 700 miles from the gulf, by its north and south channels, on either side of Wolfe Island, the sole outlet to the waters of

the lakes. The whole length of the lakes following the windings of the water course is about 1270 miles, thus making the length of the St. Lawrence, from the source of the St. Louis River, which is nearly 200 miles from the western extremity of Lake Superior, to the entrance to the gulf, about 2170 miles. No river on the globe has such extensive lakes forming a part of its course, and feeding the commerce on its banks, and its water area is by far larger than that of any other river in the world.

With regard to the maximum height of the Lakes, it still requires to be more fully ascertained. The height given by the United States surveyors as that of Lake Huron above the level of the sea, or 578 feet, is 17 feet less than that formerly given on maps of the regions of the lakes, but it has been confirmed by more recent surveys on the British side. In notices of Lakes Superior, and Huron, their heights are usually stated as 625, and 595 feet respectively, which are not merely erroneous in themselves, but assign 9 feet greater fall between Lakes Superior, and Huron, and 17 feet greater fall between Lakes Huron, and Erie than is really the case. The Canadian and United States' estimates of the heights of Lakes Erie and Ontario above the sea are the same, except that in the case of Lake Erie, the one makes the height a foot greater than the other.

The level of the lakes has not undergone any great change for a very long period. We do, it is true, find terraces, in some places, on the shores of Lake Superior, rising like steps to the distance of two, or three miles back from the lake to the height of three, or four hundred feet, and which appear to have been former lake beaches from the apparently lacustrine nature of the stratified deposits, and the freshwater bivalve shells, which have been found in them. It is very

probable, therefore, that the water of the lake stood successively at these different heights. Some have also supposed, that the ridge gravel, and sand, which are found near the shores of the Lakes, and which form terraces at various elevations, along especially their south shores, 30, 90, 120 140 feet above the water, are former sea beaches, but these seem rather to be the effect of a submarine current, for otherwise, if old beaches, they would be horizontal, and parallel to the surface of the lakes, instead of constantly varying in altitude, as they do, along the same ridge. Whatever change, however, has taken place, in ages long gone by, of the level of the lakes, their present level is, in a remarkable degree, periodically permanent. This is peculiarly the case with Lake Superior, where large pine trees, at least a hundred years old, are seen only three, or four, feet above the surface of the water, shewing, that the level of that lake has not materially varied for a century past, and, although recent observations have led some to think that Lake Huron, as well as Lake Nipissing which discharges its waters into it, has fallen below its ancient level about four feet, we have no evidence to lead us to infer, that the waters of Lakes Erie, and Ontario have subsided, even by this comparatively small amount.

The reasons of this are sufficiently obvious. The great lakes are not lakes formed in the valleys of mountain ranges, into which rapid rivers flow, and which, at one time, are swollen much above their usual height, and, at another, are as much depressed below it; but they are fed by innumerable rivers, flowing through a comparatively level country, with too little descent rapidly to carry off their waters, and the rain, and snow, by which their streams are maintained. Any rise, also, which may

have taken place in autumn is prevented from increasing by the land around all the lakes being icebound for a considerable time during the winter, so that the supply throughout the year is thus rendered more equable, and they are kept always very nearly at the same height. None of them moreover has any very rapid current at its extremity to deepen its outlet. This being the case, and the discharge of water thus remaining the same, and the mean annual temperature, and consequent amount of evaporation from their surfaces, as well as the average quantity of rain, and snow, remaining nearly unaltered, we have no grounds for supposing, that the levels of these lakes should be permanently affected to any great extent.

*A priori*, this is to be looked for least of all in the case of Lake Superior, where the waters are of great depth, and which is not liable to have its bed raised to any extent by the deposits carried down by the rivers, flowing for the most part over stony beds; while its exit, at some distance above the Sault Ste. Marie, is gentle, and over a channel of the hardest rock, and the discharge therefore will be nearly uniform, while the annual average of temperature, rain, and evaporation must be considered to remain nearly the same in amount. And we have seen that this is in complete accordance with the fact. There are some differences in the circumstances of Lakes Michigan, and Huron, Erie, and Ontario, such as the less resisting nature of the rock at the outlet of Lake Huron, and the greater amount of moisture carried off by evaporation, as the surrounding country becomes more widely cleared, and exposed to the sun. These circumstances lead us to the conclusion that, on the whole, there will be a fall, with quicker rises; and falls from time to time, but we have no reason to think, that they will, in any considerable

degree, modify the general result of a periodical permanency of the level.

At the same time, all the lakes are subject to certain periodical rises and falls, according to the season of the year, and the nature of the seasons, according to their greater drought or wetness, for a longer, or shorter succession of years. Thus in 1845, from 1st June to December 31st, Lake Ontario fell two feet three inches. From February to June, 1846, it rose fifteen inches, and then fell until November in the same year, when it was two feet lower than in June, 1845, or about the same height as in November, 1845. And, during the past year, (1852,) the level of the same lake was greatest in January, more than two feet less in July, and only one foot less on the 31st December. The other lakes vary in their level in the same manner. In 1846, Lake Superior, and all the upper lakes were considerably below their former water marks. In 1838, Lake Erie was higher than it had been since the beginning of the century, but lower as we have some reason to think than it was in 1790. From 1838 it began to fall, and has since again risen. The rise of Lake Michigan between 1819 and 1838 was no less than  $5\frac{1}{2}$  feet. The effect of these alternate rises and falls of the waters is often very sensibly felt in the stopping of mills, the flooding and interruption of roads, and the production of shoals of greater or less depth on the shores of the lakes. If we enquire how these continually recurring variations are to be accounted for, it is evident, that unusually rainy and snowy seasons, or differences in the amount of evaporation in colder or hotter summers, must be accompanied by a corresponding amount of extraordinary change of level. But, in general, owing to the moisture of the ground, and the snow, which supply them, being, in

a great measure, locked up by the frost in winter, and the flow from the lakes through their connecting channels, and the St. Lawrence continuing uninterrupted, the waters are at their lowest early in the spring. They then rise, until the distant ice of the countries bordering on Lakes Superior and Huron has been thawed, and, in its now liquid state, has passed down to the other lakes, and contributed gradually to fill up the lakes of this great natural canal to their maximum height. Thereafter the drought and frost again begin to cut off the supply, and the level sinks until the following spring.

We may remark, that the lakes are subject to sudden changes of level, although of a very temporary nature, produced by strong winds blowing for a greater or less length of time in one direction. This is particularly the case with Lake Superior. The waters of that lake are always very much colder in summer than the adjacent land, over which the air is highly rarefied by the heat of the ground below. In this season, therefore, the lake is exposed to violent gusts, and storms, caused by the disturbance of the fluid equilibrium, and the waters are often, for the time, raised upwards of a foot, on the leeward shore. For this reason, also, the bars at the mouths of the rivers which flow into Lake Superior, and which are formed at the point where the force of the descending water and that of the waves impelled by the wind mutually neutralize each other, and allow the sedimentary materials to be deposited, are of greater extent than on the other lakes, and form obstructions to their navigation except by small vessels. The same appearances are observable in the lower lakes, though to a less extent. In 1845, an ebb and flow of the waters of Ontario took place, to the amount of two feet, caused by the passage of

a tornado, accompanied by waterspouts, and hail, over the lake. No tide has been observed in these inland seas, for being so small, all their particles are attracted at the same time with nearly equal force, but it is possible that in Lake Superior at least, a tide may yet be traced, to some slight, yet appreciable extent.

The length and breadth of the lakes may be regarded as invariable, but the height, as we have seen, is to a certain degree variable. The depth will of course be also liable to a corresponding variation, so that harbours which, when the waters of the lakes are at a high level, are accessible to large vessels, will be unapproachable by them when the water is four or five feet lower. Their beds are also being gradually made shallower by the wearing away of the banks, and the deposit of alluvial matter, although the waters may stand at the same height, being spread over a larger area, in consequence of the encroachments which they make on the land. Thus, since 1796, Lake Erie has encroached on the coast at Cleveland 265 feet, and the Canadian shore from Detroit River to Long Point is losing even faster than that on the opposite side, and, in other places, particularly at the foot, and in the course of the connecting rivers, large sedimentary deposits are being made. The lakes must, therefore, be becoming shallower, for there is no strong current through them to deepen and clear out the channel. The amount, however, of this decrease of depth, for a long series of years, will be exceedingly small. In connection with the depth of the lakes, it is remarkable, that they are all, with the exception of Lake Erie, much below the level of the sea. They have, in consequence, been spoken of, in books of some authority, as likely to have a subterranean communication with the ocean. But little would be known by us of the lakes as

they really are, if we should indulge in such gratuitous and absurd hypotheses. If there were a subterranean communication with the sea, it is evident, one would suppose, that the lakes would then sink to its level, and become small sheets of water at the bottom of deep valleys, and Lake Erie would be converted into dry land, just as by a communication being open (for such a communication has also been supposed to exist) between the Sea and the Caspian, and the Dead Sea, a reverse action would cause them to overflow, and flood the surrounding land.

The amount of water issuing from the upper lakes may be judged of from a computation which has been made at the outlet of Lake Erie, where the channel in one place is only 1700 feet wide, and 42 feet deep, and the water runs at the rate of six miles an hour. The quantity thus discharged is about 20 millions of cubic feet, or upwards of 600,000 tons per minute, which, passing, about 20 miles below, over the rapids and falls of Niagara, furnish an immense water power, already begun to be taken advantage of, and likely to be so more and more every year. Supposing this estimate of the quantity of the water to be correct, and, as it appears to have been made with some care, it is probably not far from the truth, we may consider what the effect would be upon the waters of the lakes above, if this discharge were continued for a year without its place being supplied by any rivers flowing into them. Their level would sink about four feet. To this fall must be added the loss by evaporation during the same period at a mean annual temperature for the whole surface of  $44^{\circ}$  F. The further depression of level thus produced we may estimate, from the quantity evaporated per hour at that temperature, at two and a half feet, which, added to the former quantity of four feet, makes

the whole fall of the waters, on the supposition of the losses thus occasioned not being filled up, six and half feet. These, however, are repaired by the quantity of rain and snow which they receive on their surface, together with that which falls on the area of the lake basin, and is not absorbed, or evaporated, but feeds their tributary streams. The average annual quantity of rain and snow, in inches of water, may be taken as 36 inches. This falling over the lakes themselves would raise them three feet four inches, and the like annual amount being deposited on the remaining 200,000 miles and upwards of the area of their basin, and being supposed to be wholly conveyed to them by the rivers which flow into them would raise them about seven feet higher, making in all ten feet. But there is reason to think, that at least one-half of the rain and snow which fall on his latter area is again carried off by evaporation before it reaches the lakes, and, therefore, the quantity of the rise in the lakes produced by the deposit of moisture from the atmosphere will be less, to the extent of about three and a half feet than it would otherwise have been, although we have not yet sufficient data to speak with much precision on the point. The whole rise, therefore, will, on this supposition, be six and half feet, and thus balance the loss by the discharge of water, and the evaporation from the surface of the lakes.

The water of the great lakes, and of the St. Lawrence from the Thousand Islands to its junction with the Ottawa, is remarkable for its clearness, and its purity. In Lakes Superior and Huron, in particular, any white object sunk beneath the surface can be seen at the depth of many fathoms. This is no doubt owing to there being few, or no large rivers flowing into them through deep alluvial soil, which, in the

times of flood, they would carry down into the receptacle below. Their principal tributaries flow over rocky beds, and deposit a great portion of the *debris* which they roll along in successive small lakes, before it can reach the mouths of the rivers, and affect the transparency of the inland sea into which they flow. The same thing takes place on a larger scale in the great lakes themselves, each of which, by allowing the sediment from the lake above, and the connecting river link, to be deposited at its upper extremity, acts as an immense filter to the waters which flow into it. And, in consequence of this, the St. Lawrence down to Lake St. Louis, and generally, throughout its whole course to the sea, is the most transparent large river in the world. The waters of the lakes are exceedingly pleasant to the taste, and, from the continual influx of fresh water, they are also very soft and pure. There is hardly a trace of sulphates, and altogether but a small portion of solid matter, in the waters of Lake Ontario, chiefly chloride of calcium. And we have reason to think, that the nature of the water will be found to be in a great measure the same both in the lakes above, and in the St. Lawrence, down to Lake St. Louis.

The difference between the mean annual temperatures of the extreme points north, and south, of the shores of the lakes is very considerable. But as the climates of both extremities are only varieties of what may be termed a climate, of extremes, the summer heat at both points is quite sufficient for the production of the necessaries of life. In the coldest month of the year, the isothermal of  $5^{\circ}$  F. passes on the northernmost point of Lake Superior, while in the hottest month the same point is reached by the isothermal of  $63^{\circ}$ . The mean temperature of the southern limit of the lake area

during the coldest month is  $25^{\circ}$  F., and that of the hottest  $72.5$ . The mean annual temperature of Toronto and Kingston, which is very nearly the same, or about  $44^{\circ}$  F., or nearly the same as the degrees of latitude of these places, is also about the mean annual temperature of the whole area, of the genial and almost tropical climate of Ohio taken together with the cold of Lake Superior, and the climate of the intermediate regions. It appears probable from the meteorological observations which have been already made, (as indeed naturally might be expected to be the case), as the country becomes more widely cleared and settled, that the annual temperatures have somewhat increased, and that, at the same time, the distribution of heat has become more equable, the summers being less hot, and the cold of the winter less intense. Upon the whole, however, the mean annual temperatures are less than those of  $10^{\circ}$  higher latitude in Great Britain, and the western part of the Continent of Europe. The cause of this lower annual temperature it is not difficult to account for. It is caused not by a greater heat in the latter during the summer, for it is considerably less, but by the greater cold of the North American winters. In North America large tracts of land extend much nearer to the pole than on the north of the western portion of Europe, and the lowness of the ridge between Hudson's Bay and the lake coasts, permits the cold of the north easily to reach the latter. Hence too our north-west winds have the greatest effect in lowering the thermometer, and the most westerly Districts of Canada West are more liable to frosts late in the spring and early in the fall, than those nearer Lake Ontario.

The presence of the lakes, however, on the other hand, has a very powerful influence in rendering the climate more tem-

perate. In general, it is to be observed, that the difference between the temperature of the night, and that of the day, on land is found to be about thirty times greater than the difference of the temperatures of these periods over water, and hence the tempering effect of their vicinity may be easily conceived to be very considerable. Towards the approach of winter, moreover, the temperature of the surface of the water in the lakes is much higher than the average temperature of the surface of the land, and heat continues to be given forth, during the whole winter, from by far the largest part of the surface of the lakes which is always unfrozen. And, where they are frozen in the neighbourhood of the land, the whole body of the water from top to bottom must have been first cooled down to  $40^{\circ}$  F., and then the temperature of the surface lowered to  $32^{\circ}$ . It thereafter begins to freeze, and in so doing gives out the latent, or absorbed heat, as it is termed, of the liquid state, the amount of which is so great, that, for each pound of water thus converted into ice, as much heat is given out as would raise another pound of water at  $32^{\circ}$  to the temperature of  $172^{\circ}$ . And hence the dense, curling mists seen over the shores of the lakes, when the ice is "taking," as it is called, which are caused by the colder air of the surrounding atmosphere condensing the moisture of the warmer air the surface of the lake. Thus the lakes moderate the immediately over climate in winter, and maintain a certain uniformity of temperature, which, although comparatively low, is more favorable to animal and vegetable life. In spring, again, the effect is reversed, and the heat is tempered by the ice, when thawing, absorbing a large portion of the caloric of the atmosphere, and by the lower temperature generally of the waters of the lakes, compared with that of the adjoining land.

The tendency of the lakes to temper the climate on their shores, which we should thus infer to be considerable, is quite in accordance with the fact. Differences in latitude of places ought, *ceteris paribus*, to be expected to be marked by corresponding differences of annual temperature. But the neighbourhood of these lakes is found to have a much greater influence than differences of latitude, or differences of elevation. For, in consequence of the vicinity of these inland seas, the isothermal lines between the extremities of their basin, in winter, rise in a very marked manner towards the north, and, in the summer, descend again towards the south. For the same reason, the climate of the south shore of Lake Erie at Cleveland, in Ohio, is much more temperate than at Cincinnati, Marietta, and other places in that State, three or four degrees further south, the greatest cold being from 5 to 10 degrees less at Cleveland. The peach crop, therefore, and many tender, and early flowering fruits, and shrubs, often succeed at the latter, while, in the former, they are injured, or destroyed by frosts in the spring.

The amount of the fall of moisture from the atmosphere in the form of rain, and snow,\* on the lake shores, until more extended observations at different points be made on this subject, may be taken, as on an average 36 inches, the most part of which falls in the middle of summer, and in the autumn. The quantity of rain which falls annually is doubtless increased by the evaporation from the surface of the waters, and tends, with the greater amount of vapour suspended in the air, to prevent the evils, in the summer, of excessive drought.

\* Six inches of newly fallen snow are very nearly equal to one of water.

The prevailing winds are from the north east, and south west. They are more sudden in their changes, but very seldom blow with such force as in Great Britain. This is, no doubt, owing, in a great measure, to an almost constant succession, in this part of North America, of short intervals of about two days and a half, during which only the wind continues in the same quarter, and then veers round to blow for a similar period in a different, and generally opposite, direction. Any disturbance, therefore, of the fluid equilibrium, which may have taken place, during so brief an interval, is speedily balanced, instead of being suffered to accumulate, and lead by a more intense reaction to storms of more destructive violence. Secondary currents of land and lake breezes, are felt to some extent on the shores of all the lakes, but especially on the shore of Lake Superior, where the difference between the temperature of the lake, and of the land, is the greatest. Occasionally a tornado strikes the lakes, accompanied with water-spouts, and hail, as was the case on Lake Ontario in 1845. When a strong eddy is formed in the current of air in certain localities, where the atmosphere is highly rarified by heat, and electricity is at the same time strongly developed in the clouds above, the loose dry soil, and even solid bodies below, becoming oppositely electrified by induction, are raised, and whirled round in the centre of the vortex, and present the appearance of a solid column, moving onwards with the current, which has set them in motion. When it passes over water, the water is raised in the same way, and presents the appearance of a long tree-like tube between the over hanging cloud, and the lake. But these phenomena on the lakes are comparatively rare in their occurrence, the breadth of their course is very narrow, and as the amount of water thus raised up, there is reason to

think, is small, the danger to a vessel, encountering one of them in its path, would be chiefly from the force of the whirlwind itself. Although, however, the winds in the region of the lakes are in general much less violent than on the Atlantic, and on the coasts of Great Britain, yet, owing partly to the the greater shallowness, and shortness of the sea on the lakes, and partly to their less density, sickness often affects upon their waters the sailor, and the traveller, who have seldom, or never felt it in many voyages on the Ocean.

The phenomena of *looming*, and *mirage*, caused by the light passing through currents of air differing in an unusual manner in their density are not uncommon on these lakes in hot weather, or at other times when the difference between the surface heat, and the temperature of the air above is considerable. In the former, objects on the horizon, and even those below, appear raised above it, in the latter the images of near, or distant, objects are seen inverted in the air.

Electrical intensity during the winter, at the surface, is much greater than during the summer, but the electricity developed, during summer, over and around the lakes is much larger in amount. Yet the thunderstorms in the country on their shores are rarely of remarkable severity, because the moisture in the air above conducts it more rapidly away, than where the atmosphere is drier. Hence storms of lightning are more violent on the Isthmuses of Niagara, and Detroit, and down the St. Lawrence where the land is more continuous.

The only other remarks connected with the meteorology of the lakes, which we shall here make, are with regard to the variations in the declination, and dip, of the magnetic needle. These are subject to very remarkable local varia-

tions in the vicinity of the lakes in many places, owing no doubt to iron disseminated through the rocks, or in massive beds of that metal which are found within the area of the basins of the lakes. These variations, however, being caused by local attraction in the land, in a great measure, disappear in the compass of a vessel on the surface of the lake. Leaving these local variations out of view, it may be observed, that the line of no variation, or that in which the needle points due north passes near to the Sault St. Mary. West of this the needle points easterly, and east of it the variation is west. In the neighbourhood of Kingston it is about  $4^{\circ}$  W., at Toronto  $1^{\circ} 43'$  nearly, with a mean annual increase of about  $2'$ . At Toronto the mean inclination, or dip of the needle is about  $75^{\circ} 21'$  with an annual increase of 0.89; the mean horizontal intensity is 3.53043, with an annual decrease of .0042, and the total force is 13.8832, both in absolute measure. The diurnal variations of the declination are greatest in summer, amounting in August to  $13'$ , and least in winter with a minimum of about  $4'$ , but the dip of the needle is greatest from October to February.

In a geological theory of the formation, especially of the lower lakes, and of the great plain in which they lie, the primitive and metamorphic range passing through the Thousand Islands, and to the north of Canada West, ought to hold a conspicuous place. The strata around the shores of the lakes abound with marine fossils, which shew them to have been formed at the bottom of a shallow sea. They must, therefore, have been upheaved by some violent subterranean action. Now, as the granite with the oldest stratified rocks, and the copper veins, and trap overflows, on the north of Lake Huron, are older than the Lower and Upper Silurian strata which lie upon them in almost undis-

turbed repose, and almost horizontally, with only a very slight dip from N. E. to S. W., these igneous rocks could not have been the cause of the upheaval of the more recently deposited Silurian. It seems probable, that it was by the elevation of the spur of the Alleghanies passing northward into Canada to the east of Lake Ontario, and forming the high ground of Canada West, and which has penetrated, and altered in the most striking manner, the Silurian strata in contact with it, that these strata were raised, and the present aspect of mingled land and lake, was produced.

The evidence, derived from the nature of its fossils, of the sedimentary rocks within the area of the great lakes being a marine deposit consolidated by water pressure is, in itself, perfectly conclusive. We may here notice, however, more particularly another circumstance, which, there seems to be no doubt, is owing to the same cause, their being formerly covered by the waters of the sea. It is well known, that, around the shores of Lake Ontario more especially, at various depths below the surface, near Syracuse, at St. Catharines, and in our own neighbourhood, there is an almost exhaustless supply of salt water. Rock salt is not a substance which is found in any part of the world in the formation in which those brine springs occur, and there is no probability, therefore, that they are to be traced to any deposit of that mineral below the surface. Indeed the fact, that this salt water is found at a very moderate depth in this neighbourhood, where the series of rocks in which it is found is well known, sufficiently proves this. Its presence, therefore, can be accounted for only by the area in which it occurs having been formerly the bed of the ocean; the waters of which penetrated, under the great pressure above, by fissures such as abound in the limestone rocks, and other-

wise deep into the deposits beneath, and are there held confined, sinking by their greater specific gravity below the fresh water which may be floating above. This salt water, it may be remarked, is not like a solution of rock salt, as in the brine springs of England, which are nearly pure solutions of chloride of sodium. It is much more mixed with earthy salts, particularly those of lime, than that of the sea, from its being so long in close contact with the rocks beneath. The lakes, which were doubtless once all salt, have become fresh, unlike the Caspian, or other salt lakes which have no outlet, by their having an outlet in their several communications with one another, and in the main stream of the St. Lawrence, to allow the fresh waters of the rivers by which they are fed to flow through them. How strange to think, that in the very brine which is brought up from no great distance, close to the very spot in which we are met, we find the traces of a former state of things, when the surface of the land around was covered by the waters of the sea !

The geology of the land area of the basin of the lakes may be briefly thus described. North of Lake Superior primary rocks, consisting chiefly of granite, hornblende and micaceous gneiss, abound, with numerous trap overflows, and dykes of greenstone, porphyry, amygdaloid, and basalt, both on the N. and on the S. coasts. Upon these rest what appear to be the synonyms of the Cambrian rocks in Wales. On the N. shore of Lake Huron granite and quartz rocks abound, accompanied also with the same Cambrian formation, and greenstone dykes, and overflows, upon which the Lower Silurian strata rest uncomformably. Towards the N. E. of the same lake, the Silurian beds rest directly on the primary rocks without the Cambrian strata,

which are found, however, again on the north of the sienitic range about Lake Temiscaming. Connected with the ridge to the north east of Lake Huron, is a range of primary rocks, the principal of which are sienite, metamorphic limestone, serpentine, dolomite, and talcose rocks, running across at an average of 40 or 50 miles from the lakes to the Thousand Islands, and Lake Champlain, and from which branches off the chain which runs to the north of the St. Lawrence down to Labrador. To the S. W. of this primary boundary on the N. and E., the stratified rocks rise up in succession at a small inclination from the Lower Silurian to the Devonian, and carboniferous rocks of Michigan, and the South. Deposits of blue, yellow, or red, post-tertiary clays, with ridges of drift, and boulders both in and upon them, are spread over the whole of this area. There are multitudes of these boulders on the mountains more than a thousand feet above the level of the lakes, and on the shores of Lakes Superior and Huron, and the other lakes, with polished surfaces and longitudinal furrows, grooves, and scratches, generally in a direction from N. to S., but varying to the E. or W. of it, apparently according to the vicinity of neighbouring ranges of igneous rock. The rocks below the diluvial clay, and drift, are polished, and grooved in the same manner, and in the same direction, so that the same cause, whatever we may conceive it to be, which led to their being thus marked must have carried with it the boulders, and the drift. The more immediate agent in this, we are inclined to think, was mainly the upheaval of mountain ranges, as, for example, the Rocky Mountains, during the elevation of which from the sea the violent agitation of its waters, raised up at the same time, continued, we may not unreasonably suppose, for a considerable

period, and swept along large masses to hundreds of miles from their original site, and rounded, and marked them in the way just alluded to. No doubt many of the boulders may have been transported also by floes of ice, and icebergs detached from their moorings, or carried along by the heaving current of these mighty earthquake waves, but the glacial theory is altogether inadequate to account for the whole, or even the chief part, of the appearances which the surfaces of the rock and of the boulders present. In some instances, as on the south shore of Lake Superior, and in the approach from the south to the iron beds of Marmora, and Madoc, north of Lake Ontario, huge masses of limestone, many tons in weight, are scattered over the ground, which can be traced beyond dispute to the strata in the immediate vicinity, and which, it appears evident, have been conveyed to their present position not by any glacial action, but by an oceanic current. And, if an ocean current must be supposed to have been the agent of transport of the boulders in such cases, its action must have extended from Lake Superior to Lake Ontario.

With regard to the zoology of the lake region, no complete or systematic information, in so far as the Canadian side is concerned, yet exists, but a very full account regarding the zoology of the opposite shores is to be found in the State Reports of the different States on their other side, especially in that of the State of New York. Upon the whole, however, it appears, that, while the structure, and arrangement, of the inorganic kingdom are almost identical, none of the indigenous animals are the same as in the Old Continent, although some of the species very closely resemble each other. The common deer, (*Cervus Virginianus*,) of the country, for example, although nearly allied to the deer

of Great Britain, is yet different. And Agassiz, the highest authority in Ichthyology, declares, that there is not a single strictly fresh water fish in North America exactly the same with any of the Old Continent, although many are of a similar type. One of the most singular of the fishes of the lakes is the *Lepidosteus*, or bony scaled fish, which is found in Lake Superior, as well as in the Ottawa, and other rivers of the north. It is remarkable for being almost the only species now existing, which in the nature of its scales, and its heterocercal tail, and other parts of its structure, closely resembles the fossil fishes of the older formations. The same remark regarding the dissimilarity of the species, otherwise the most nearly alike, applies generally to the plants of the lake basin, and of Europe, when compared together. The remark, however, which applies so strictly to the Fauna, is not so universally true with regard to the Flora of the lakes, and in the trap regions of Lake Superior we find a vegetation which is in many cases identical with that of the Higher Jura of Switzerland, and the trap districts of Great Britain, and in which the botanist is delighted to recognise not a few of the plants of the hills, and vales, of the British Isles.

The furs, and fisheries, particularly of the western lakes, form a branch of commerce of considerable and increasing value, especially the latter. White fish, lake trout, and sturgeon of great size abound in Lakes Superior and Huron. White fish are also caught in large quantities in Lakes Erie and Ontario. 3590 barrels of fish were exported from Lake Erie alone in 1851, valued at 5 dollars a barrel, and this is but a small portion of a traffic which is yearly increasing in all the lakes. But the chief natural productions of their basin are those of the forest, and of the

mineral kingdom, almost exhaustless supplies of the finest as well as the most useful timber for the shipbuilder, the cabinetmaker, and the carpenter, bituminous coal from Michigan, close to Saginaw Bay in Lake Huron, one of the great American coal fields, and from the two others, that of Illinois, near to Chicago, and the Appalachian coal field only 36 miles from Cleveland, iron, in the form of the magnetic, and specular oxides in enormous quantities, native copper, and its sulphurets, to a greater amount than in any other quarter of the world that we yet know of, silver, lead, zinc, manganese, plumbago, marble, hydraulic limestone, gypsum, clays, shellmarls, and building stone of every description. Of these, as we have already mentioned, copper had previously been shipped to the amount of £160,000, and in 1852, the operations were on such a scale, that the produce would be increased to about 2,000 tons, which, at £120 per ton the selling price at Pittsburg, would amount to £240,000. The value of the copper of Canadian production exported in 1851 was about £20,000. In the same year, the weight of the iron "blooms" sent down from Lake Superior was 383 tons, selling at Detroit at £16 10s per ton, and it was expected, that the quantity would be augmented in 1852 to nearly 1,000 tons. It is worthy of notice, that the iron of Lake Superior, which abounds both on its N. and on its S. shores, there is reason to think from experiments which have been made on the subject, excels in quality the iron of every other part of the world, where it has yet been wrought. Its ultimate tenacity in bars has been found to be 89,882 lbs. to the square inch, that of the best Russian being only 79,000. Of the natural productions of the basin of the lakes, however, the various products of the forests are at present far the most valuable.

In 1851, the amount of sawed lumber which reached the Hudson River was upwards of 711,000 tons, valued at about £4,000,000, currency. At least three-eighths of this tonnage was brought from the country on the shores of the lakes, and this does not include the large quantities shipped from Canada to the different ports on the other side for consumption there. But say, at a moderate computation, that the export timber trade on the lakes, and to the seaboard, by the Hudson amounts in value only to £1,500,000, we have to add to this the amount exported from Upper Canada by the St. Lawrence to Great Britain, and other markets, amounting to about half a million more, and we have thus the export productions of the forest from the lakes equal in value to £2,000,000 annually. The home consumption it is not easy to estimate, but it must of course be very great.

The cultivated productions of the soil are of still greater importance. The country of the lakes seems formed to be one of the richest agricultural regions which can any where be found. With the exception of a part of the east end of Lake Ontario, in the State of New York, the shores of Lake Superior particularly on the north, and the north shore of Lake Huron, it has almost everywhere fertile soil. From Sturgeon Bay, round by Cabot's Head, the St. Clair River, Lake Erie, the Niagara River, and Lake Ontario to Kingston on the Canadian side, and on the other from the east all round to Milwaukee, and the Straits of Mackinaw, the land is generally excellent, in some places of unrivalled fertility, producing the finest grains, and fruits, and vegetables. The whole "through tonnage" which arrived at the Hudson, and was shipped from the Western States, or Canada, by Buffalo, and Oswego, in 1851, was in value about £6,750,000, currency. To this must be added

47,000 tons which arrived at tide water by the Ontario Railroads, and a great part of the through business of the New York and Erie railroad, which would make the whole upwards of £7,500,000. If from this we deduct £1,500,000, as the value of the products of the forest, the value of the products of the farm will not be less than £5,500,000 of the remainder, and if to this we add £500,000 as the value of the agricultural products from the lakes, shipped for the seaboard by the way of the St. Lawrence, we have, at a very moderate estimate, £6,000,000 currency, for the total value of the agricultural exports of the lake basin. The whole value of the various products, natural and industrial, exported from the area of the great lakes, adding to these amounts the copper, iron, wood, and other articles exported from the upper lakes by the Ohio and Illinois Canals, cannot now be less than £10,000,000 of surplus produce, over and above what is required for the home consumption, and a large portion of the returns goes annually to swell the circulating capital of the lake country. The Canadian exports alone in 1851 amounted to £3,250,000 currency, of which the larger portion was from Upper Canada. The amount of imports into the area of the lakes is much greater. The value of the merchandise which left the Hudson River for the Western States and Canada in 1851, by Buffalo and Oswego, was £15,500,000, currency, independently of that of 29,112 tons which left by railroad, (part of which must have been through traffic,) and of the through traffic by the New York and Erie Railroad, which would make the whole from the side of the States, £16,000,000. Of this upwards of two millions were for Western Canada alone. To this must be added nearly £2,000,000 of imports into Western Canada by the St.

Lawrence from Great Britain, the Lower Provinces, West Indies, and foreign countries, thus making the whole Upper Canadian imports about £4,000,000, and the whole imports of the lake basin about £18,000,000, currency. To give some idea of the extent and importance of the traffic of the lakes, we may mention, that the whole imports into the United States, in the year ending 30th June, 1851, amounted to nearly £54,000,000, currency, so that the imports into the Western States and Canada, by the way of the lakes, is one third of the imports of all the States taken together.

Nor is this surprising when we consider, that the population of Canada, and the States in more immediate contact with the shores of the lakes, may be estimated at from six to seven millions. In 1782, Upper Canada, and the rest of the land around the lakes, was almost a wilderness. We all see, and know, the change which has since taken place on this side. Upper Canada has now a million of population, and the change, in this respect, in the opposite territory of the States is almost without a parallel. In 1810, Buffalo had only 1508 inhabitants, and Rochester was unknown. In 1850, the former had a population of 42,261, and the latter of 36,403. The growth of Syracuse has been still more remarkable. In 1840, its inhabitants were only 6,502. In 1850, they were 22,271, or more than trebled in 10 years. But the increase of Chicago, in Illinois, and of Milwaukie, in Wisconsin, far surpasses that of any other cities in the Union. In 1818, they were only in embryo. In 1840, Chicago had a population of 4,479; in 1850, it was 29,963. Milwaukie in 1840 had only 1,700 inhabitants; in 1850, it had 20,061, or nearly twelve times the number it had ten years before. Sixty-five years ago, the first settlement was made in the State of Ohio. Now it

has upwards of two millions of inhabitants. In connexion with this increase of population, which is even greater comparatively in Canada than in the States, the shipping on the lakes has increased with extraordinary rapidity. In 1817, the first Canadian steamers on Lake Ontario were built, one to sail from Prescott to Kingston, and the other up the Bay of Quinté. In 1818 there was only one steamer on Lake Erie, and forty sailing vessels above the Falls of Niagara, only two of which were of more than 100 tons burden. Now there are hundreds of steamers, and sailing vessels on Lake Ontario, and the waters of Lakes Erie, Huron, and Michigan, are traversed by numbers of floating palaces, impelled by steam, some of them from 1000 to 1700 tons burden, and more than 500 sailing vessels, many of them of large tonnage. On Lake Superior also, where, a few years ago, there was not a single vessel, there are now a paddle steamer, three propellers, and five schooners, with a burden of 1500 tons. It is not surprising, therefore, that the amount of exports and imports should at the same time be found to have been augmented in an astonishing degree, or that it should be anticipated to become yet far greater. To take for example, the exports and imports to and from tide water on the Hudson. In 1845, the through tonnage from the West, by Buffalo and Oswego, down to Albany, was 303,551 tons, the up tonnage West was 58,455; in 1851, the numbers were 966,993 down, and 192,023 up, or more than trebled in both cases in six years, while the whole exports of the United States were only trebled in 30 years previous to 1851. If the exports and imports of the area of the lakes are thus being made much more than double every four years, how enormous will the amount soon be, were no limits to be gradually arrived at to the rapid increase of the

population, to the extent of the productions of the lake region, and to the demand for them. The present value of the exports and imports together is about £28,000,000, which doubled every quadrienni period, would give £996,000,000 at the end of even 20 years. It is scarcely possible to conceive, that such a marvellous increase should be arrived at, but as to the amount of the tonnage of imports and exports now, and the present rate of increase, which have been laid before you from authentic documents, there can be no doubt, neither can there be any doubt that the increase, whatever it may be, even in that short period will be almost inconceivably great. Every way of communication to the East, and to the sea-board, will be loaded with the commerce of the region of those inland seas, and even the commerce of the Upper Mississippi, incapable of being conveyed to New Orleans, except to that very small amount, at which it is now stationary, will overleap its bounds, as it has already begun to do, in all directions, and hasten across the lakes, and by canal and railway to the great markets of the East, and thence by the Atlantic to the Continent of Europe itself.

But by what route can this transmission be best effected? The great lakes themselves are of course best fitted to be a part of it. To give some idea of their importance in this point of view, we may remark, that the length of their navigation merely, with that of their bays, is not much less than that of the 2000 miles of canals in the whole of the United States together, and the Erie Canal, valuable as it is, is but a fourth of their length. But this, though much, gives but an imperfect idea of their importance. Navigable rivers and lakes are always, in a peculiar degree, the means of the outward prosperity of an industrious and enterprising people. And great lakes, for obvious reasons, much more so

than rivers, having a wider area for the handling of larger vessels,—a longer circuit, by which many more points may be reached from one another, no current to make their ascent by sailing vessels difficult, and not being liable at one time to lowness of water, like the Missouri, which, for more than half the year, is scarcely navigable by vessels drawing more than two and a half feet water, and at another to annual inundations, which render such rivers as the Mississippi uninhabitable for hundreds of miles on their banks, and produce numerous obstructions to the navigation. The lakes are, in fact, innumerable canals in one, a cheap, and universal railway, which, at the expense only of the termini of the road, can be traversed by steam in all directions, to great distances, at the rate of from 15 to 18 miles an hour. They are thus admirably adapted for internal commerce, uniting, while they divide, and enabling every point on their shores to supply, or be supplied, by all the rest without difficulty for nine months in the year. Their existence and position have been wisely adapted for the promotion of the intercourse of a vast continent like North America, and for being the centre of its circulating system, to a much greater extent than the Mississippi itself. Had the lakes not existed, such obstacles would have been presented to the extended settlement of the country, and to the communications from one point to another, that it is not likely, comparatively speaking, that much progress in this would yet have been made. Even, supposing that the lakes had existed in the form of one, or two, instead of five, having the same area of surface as the five together, there would then not have been the same extent of shore, the places on their opposite coasts would then have been separated by a much greater distance from each other than they

now are, and there would not have been these great ferries on necks of land so favourably situated between the successive lakes, across the Niagara, the St. Clair, and the St. Mary Rivers, which allow of a passage to either side at all seasons of the year, and which will all ere long, as the Niagara River has already been, be bridged across.

The lakes are, therefore, of the utmost importance in themselves as the means of home, and internal communication, but they become unspeakably more important, when they are connected as they are by canals and railways with the south and east, and with the sea. Of these means of connection, laying out of view the superior advantages of railroads for the conveyance of passengers and light goods, and considering that the chief articles of export from their basin are of a bulky nature, nine-tenths of it being agricultural produce, and timber, and more suitable, therefore, for water carriage, canals are unquestionably at present much the more important, in so far at least as the export, if not the import trade, is concerned. As a proof of this, it has been calculated by the State Engineer of the State of New York, in his report of February, 1851, that it would have required *six double track* railroads, and these having other traffic from which to make their dividends, with an equipment of 10,000 cars, and 4,000 engines to perform the business of the Erie Canal in 1850. All the railways, therefore, which are, or will be made, to connect with the seaboard can never come into competition with the canals in a traffic which is every year increasing with rapid strides. And here we may observe, how little was thought of the future increase of the traffic to and from the lakes when the Erie Canal was built of such small dimensions, and how prudently our government has judged in making the

Canals of the St. Lawrence, and the Welland, on so much larger a scale.

The routes of communication between the lakes and other parts of the continent, and the sea, are various. By the Illinois and Ohio Canals they are connected with the Mississippi and New Orleans, by the Ohio and Chesapeake Canals with the Delaware, by the Erie Railroad with New York, by the Welland, and Oswego Canals, by the Buffalo and Albany, Albany and New York, and Albany and Boston Railroads, with the Hudson River, New York, and Boston, by the Cape Vincent Railroad, and its connecting lines with the same points, by the St. Lawrence and the Ogdensburg Railroad with Lake Champlain, the New England States, and New York, and by the St. Lawrence, and its Canals with the Lower Provinces, and all ultimately with the Atlantic, and the Continent of Europe. These routes, however, are by no means of equal importance, and the amount of lake traffic on some of them is, and must, there is reason to believe, continue to be comparatively small. It is not likely, for example, that it will be great by the Mississippi. For the distance to the sea is upwards of 1500 miles, with a navigation impeded by sandbanks, snags, floods, and currents, and by ice for a considerable part of the year, and the progress of barges upwards and returning, being assisted by no tide, for there are no tides in that river, and against a powerful stream, would be so slow, that where they are employed to carry down produce, they are sold to be broken up, or used for such purposes as may be required, at New Orleans on their arrival there. The current, therefore, of the traffic of the Upper Mississippi, and of the North Western States, shews no tendency to set in that direction. The Illinois, the Ohio,

and the Ohio and Chesapeake Canals are too circuitous in their communication with the seaports of the States to prove at all formidable rivals to more direct, cheaper, and quicker lines for the transmission of produce and merchandise to and from the sea. The New York and Erie Railroad is not shorter than the Buffalo and Hudson River Railroads, and is as yet by no means so well constructed and equipped, while for the transport of heavy goods and produce, it is liable to the same objections as lie, in this respect, against railroads in comparison with canals. The only route, therefore, which can compete for the carrying trade with the St. Lawrence, and its canals, are those by the Erie Canal from Buffalo, and by the Welland, and Oswego, and Erie Canals to the Hudson. In both of these transshipment is required in the progress of exports to, and imports from, tide water. But the course by the Welland is by much more expeditious, and superior in every way to the other, and promises at no distant day to be the one by which the greater portion of the transit trade of the States' side will pass. Thus, in 1840, the down trade through Buffalo was 138,101, and by Oswego 20,047 tons, while, in 1851, it stood thus, Buffalo 626,656, and Oswego 340,338, showing that while the former had increased less than five, the other had increased nearly seventeen times the amount of each respectively 11 years before. In the up trade Oswego already surpasses Buffalo, the amount up by the Erie Canal to Buffalo being only 114,960 tons, and by Oswego 131,852. Part of this increase in the exports and imports, by Oswego, is no doubt due to an increased trade with the Canada shore of Lake Ontario, but the greater part goes to, and comes from, the upper lakes by the Welland Canal, and it is evident, that the people of the States prefer this route. Nor

is it surprising, that this should be the case. The Erie Canal is 363 miles in length, very narrow, and adapted only for barges drawing four feet water, while the Welland by a cut from Lake Erie to Lake Ontario, only 28 miles in length shortens the boat canal no less than 154 miles, and is 9 feet deep, with locks 150 feet long, and  $26\frac{1}{2}$  broad, and is open throughout to brigantines and steamers of 500 tons, the dimensions most suitable at once for most of the harbours of the lakes, and for the navigation of Lake St. Clair, and the St. Lawrence River. It is not wonderful, therefore, that the route by the Welland is preferred, and that the tonnage, and number, of vessels passed through it has been considerably more than doubled in the four years from 1848 to 1851 inclusive, the tonnage in 1851 being 691,627, and the number of vessels and boats in the same year, of all kinds, 5,693. The Cape Vincent Railroad, connecting the seaports of the Atlantic with the City of Kingston, which is only 300 miles from Boston, measured on the arc of a great circle, and the nearest City of Upper or Lower Canada to New York, being distant from it by the nearest line only  $274\frac{1}{2}$  miles, is by far the most favorably situated of any of the American lines of railroad for communication with the Canadian side of Lake Ontario, and will, therefore, receive a very large portion of the import and export traffic with that side of the lakes at all times, and especially in the winter, and in the late fall, and early spring. The Ogdensburgh line by no means presents equal advantages except for the limited commerce with Lake Champlain. The Cape Vincent route surpasses it as a medium of communication not only with New York, but even with Boston, and the greater, more populous, and wealthy, portion of the New England States.

We are, however, strongly inclined to think, that the best line for the conveyance of agricultural produce, and timber, as well as of other heavy articles, to New England and New York for domestic consumption there, would be the St. Lawrence, and a Canal such as that proposed from Lake St. Louis at Caughnawaga to lake Champlain, and thence by the Whitehall Canal to the Hudson River. This would shorten the boat canal navigation 297 miles, or 143 miles more than even the Welland does, while at the same time neither the cost nor the time of transit would be increased, there would be a greater certainty of the regular arrival of the cargoes, and a large amount of foreign imports, and of the manufactures of New England, would add to the tonnage sent upwards by this route. A ship canal of a mile in length uniting Lake Huron to Lake Superior, which is already begun, is the only one required to complete this line throughout to the head of Lake Superior, connecting the head of the same lake by the Welland, and the St. Lawrence, with its canals, with Quebec, the gulf of the St. Lawrence, the Lower Provinces, and Europe. This last route is undoubtedly far the best for the conveyance of the produce, and imports, of the lakes to, and from, the British North American Colonies, and the European Continent. The distance is shorter from Quebec to Liverpool, by a safe channel through the Straits of Belleisle, and by the North of Ireland, than it is from New York by 500 miles, and from Boston by nearly 400. And Quebec is nearer to the Mediterranean than either of these ports. And we are here almost as near to Quebec as we are to New York, and when the railroad between Quebec, and Kingston is completed, will be able to reach the one City as soon as the other. In the navigation, moreover, descending from the Upper lakes to Quebec only 28

miles of canal would require to be passed through by steamers and in returning only 61½ miles more of the St. Lawrence canals, which have at an average 9 feet of water, and locks 200 feet long, and 45 broad, and are therefore amply sufficient for the reception, and passage of the largest vessel, which it seems desirable to construct for the traffic on, and between the lakes, and even of sea going vessels. This route will be open as soon, and shut as late as the Erie Canal, or rather more so, there being on the whole a gain of upwards of a fortnight in favor of the St. Lawrence, and it will have the further great advantage of no transshipment being required in the course to the sea. It will enable us to increase our traffic by the Gulf of the St. Lawrence with Great Britain, and the Continent of Europe. It will enable us to supply with flour, and grain, direct from Canada, the Lower Provinces which now receive from New York, to the amount of about 700,000 dollars, those products, in many cases after they have been originally exported from Canada to New York, and to obtain from them in return the products of their mines, and fisheries, the sugars of the West Indies, and the wines and fruits of Portugal, and Spain. This route may be followed to a vast extent, as it ought to be, and, at the same time, the Welland, and Oswego, and the Caughnawaga lines, be eminently successful.

No river, except the La Plata in South America, has so wide an estuary, and is navigable so far for large vessels as the St. Lawrence, which admits ships of the line to Quebec, and ships of 600 tons to Montreal, and when the canal of only one mile in length between Lakes Superior and Huron, is completed, as it will very shortly be, there will be a continuous water communication from the Sea for 2000 miles,

for vessels of 500 tons. With its wide stretching Lakes, noble river, and magnificent canals, and when traversed, as it will very shortly be, in its length and breadth, by a network of well constructed railways, in front by the Main Trunk line, and Great Western, and in the rear by that of Peterborough, and the Georgian Bay, and other connecting lines, the means of Canada for both internal and external communication may be said, without exaggeration, to be unequalled by those of any other country whatever.

But now, and at all times, except during the period when the navigation is closed, the route by the Gulf of the St. Lawrence for the lake commerce of exports to, and imports from, the Lower Provinces, and the continent of Europe, appears to be by far the best. I do not, I confess, see how flour, which can be delivered as cheaply in Kingston, as in Oswego, cannot be sent more cheaply from Montreal, or from Quebec, than from New York, for the expence of transport of a barrel of flour to New York from Oswego is greater than from Kingston to Montreal, and no transshipment is necessary before it reaches the port of final lading, and Montreal and Quebec are both nearer to Great Britain than New York is. It appears evident, that, if that were done, which seems to be all that is required,—if the ship owners, and shipbuilders of Quebec were to build more vessels, which they can do more cheaply than any where in the States, and not resort to American vessels brought round in ballast to convey produce to the British Market, and the freights were made as low as possible so as to turn the scale in favor of the St. Lawrence route,—if the Gulf were properly buoyed, and more perfectly lighted on the North, as well as on the South shore, to the entrance of the Straits of Belleisle,—if a line of tug steamers were established to be

employed when necessary in towing vessels up the gulf, and harbours of refuge were constructed, one for example, on the island of Anticosti, employing perhaps convict labour for that purpose, that the agricultural products of the lakes, would come to be conveyed to Britain, and the continent of Europe, by the St. Lawrence rather than by New York. But the merits of this route will soon be more fully tested by the more extended communication already begun between Great Britain, and the St. Lawrence, by means of lines of Ocean Steam-ships running from Liverpool, and Glasgow to Quebec, during the season of open navigation, and the safety of which will require to be carefully provided for by every thing which the government can do to improve the navigation of the Gulf.

I have thus endeavoured, my friends, to bring under your notice the principal facts connected with the great lakes, which, as most of them are not stated any where in a systematic form, or adapted to the subject of our present consideration, I have endeavoured, at some pains, to ascertain, and to verify. I have also endeavoured to lay before you, in as perspicuous a manner as possible, such observations, and inferences, as occurred to me, and appeared to be of most consequence, in connection with these facts. And now, in a few words, to conclude this, we fear, too long disquisition.

When we consider the important purposes which the lakes may be, and have been made to serve, of facilitating intercourse and traffic in and with a country so abundant in those things which mainly contribute to the support, and temporal comfort, and advancement of man, in grains, and fruits, in wood, and coal, in iron, and copper ores, and which without them would have been, in a great measure,

scarcely habitable, or accessible, we may without irreverence, nay we are rather called upon, with deepest thankfulness to conclude, that the lakes have been designed by the Allwise Creator for these ends. And, this being our conclusion, we are, at the same time, led, both in lake and in land, and all that them inhabit, in the vast expanse, and ever changeful aspect of the inland sea, and in the varied, and munificent gifts of the land, to behold the power and goodness of Him, who has meted out the waters, and clothed the earth with fertility and vegetable life ; and to hear His voice amid them proclaiming His presence in the ever during thunder of that mighty cataract, which, although the mountains of the region of the lakes are of low elevation, and their tributary streams are small, yet, with the lakes themselves, and the pure and majestic river which flows from them, forms wonders enough for one portion of the globe.

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# THE NATURAL AND INDUSTRIAL PRODUCTIONS OF CANADA,

WITH THE REAL FOUNDATIONS FOR ITS FUTURE PROSPERITY.

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IN the lecture of last year, on "The Inland Seas of North America," we had occasion to dwell at some length on the facilities which they afford for the intercourse, and commerce, of the countries on their shores. We now propose, in connexion with the same subject, to speak of the natural and industrial productions of Canada, that country by the western division of which they are bounded on the north throughout their whole extent, and in the prosperity of which we are more immediately interested. We shall not occupy your time by any preliminary remarks, as the consideration of the subject itself is amply sufficient for the limits of a single lecture, but proceed at once, to consider, in the *first* place, the natural productions of Canada.

I. According to the usual division, these may be divided into the productions of the Forest, of the Mine, and of the Seas, as its industrial productions may be divided into those of Agriculture, and of Manufactures.

1. *First*, in the order now mentioned, of its natural products are those of the Forest, which as yet far exceed in value those of the Mine, and of the Seas, and even somewhat exceed those of Agriculture, and all other exports put together. The value of the wood of the white pine alone exported by the last returns of 1852 is upwards of £1,000,000, the next in value of the timber exports being those of Red Pine, Oak, and Elm. In 1853, 1145 vessels were loaded with timber at Quebec against 1003 in 1852, shewing that the trade

must have greatly increased during the past year. The exports of wood to Europe, and the lower provinces, are chiefly from Quebec in the forms of round, and square timber, deals, and planks, West Indian, and other staves, together with masts, and spars. The imports to the United States are generally in the form of planks, and boards. By far the largest portion of the trade is with Liverpool, but the best kinds of timber, particularly of deals, go to the London market. Besides these products of the forest, the wood which is burnt off the ground in the new clearings, and for the purpose of fuel, yields large quantities of Pot, and Pearl Ash, of which the value of £232,004 was exported in 1852 for bleaching, glass making, and other purposes. Furs, and skins may also be reckoned as other productions of the forests of Canada, and were supplied by them in the same year to Great Britain, the United States, and other countries to the amount of £25,547.

In 1852, the total exports being £3,513,993, the whole exports of the produce of the forest amounted to £1,907,183, including £262,600, as the value of the ships built at Quebec, of which £1,436,637 were sent to Britain, and £460,049 to the United States. The amount of wood exported, however, is but the smaller part of the natural riches which Canada draws from its forests. Probably not less than £3000,000 of the materials which they afford is employed for domestic purposes, for fuel, and for the building of houses, barns, fences, ships, wharves, and other structures of wood, thus making the total value of the annual produce of the Canadian forests about £5,000,000 currency.

With regard to the useful qualities of the woods themselves, these may be inferred from the fact, that more than two thirds of the wood imported into Britain comes from

British North America. The white, and red, pine form invaluable materials for all ordinary purposes, while the white oak is inferior only to that of Britain for ship building, and the swamp elm, as a material in the construction of ships, is sought after as superior even to British elm.

Although the quantity of timber fit for exportation is being rapidly diminished, it is still very considerable in the unsettled parts of the country, and will doubtless suffice to keep up the amount of export at its present rate for some years to come, but it cannot be expected to do so long, when we consider the enormous amount shipped every year to other countries, and the great, and growing requirements for timber of different kinds within the Province itself. The extensive lines of railway already begun, and to be carried on so rapidly to completion, will themselves require a very large and immediate supply for the erection of station houses, for sleepers, ties, waggons, cars, and fencing. And it is a great advantage which Canada possesses in the construction of her rail-roads, that no country has materials of this description so cheap, and so abundant. Unless, however, a system of reproduction be, at the same time, carried on, it is evident, that with such vast, and constant, drains, timber must become scarcer, and dearer, every year, and instead of being a source of great wealth, and of the utmost benefit to the province, as it now is, may even require to be imported at great expence from the lower Provinces, and from other countries for home consumption. While, therefore, it is to be regretted, that trees are not more generally planted throughout the province for ornament, it is still more desirable in an economical point of view, that plantations were made throughout the country, in order to provide a supply for the wants of the Province itself, and for exporta-

tion, after the present stock is exhausted. In places where the soil is of a light and sandy description, or on broken, and rocky ridges, the area would be occupied much more profitably by woods, than otherwise, while the rest of the land would yield its plentiful returns to the labours of the husbandman. And it would be well, therefore, if Agricultural Societies, like the Highland, and Agricultural Society of Scotland, taking an enlarged view of their object in promoting the cultivation of the soil, should institute premiums for the plantation, in such localities, of woods of the great staples of pine, oak, and elm.

2. The next source of the natural products of Canada is the *Mine*. Although yet very imperfectly developed, its mineral wealth is very great. The only productions of the mine exported in 1852 were copper and copper ore to the value of £8,105 from the Bruce Mines, and a small quantity of pig iron. But various other minerals already add to the riches of the country, and supply materials for useful applications within its own limits. Mining for gold, on a small scale, is carried on with profit by skilful hands on the branches of the Chaudière. The white potsdam sandstone is quarried at Vaudreuil for the manufacture of fine glass. Salt is procured from the brine springs of St. Catherines. Plaster of Paris is prepared in large quantities from native gypsum in the western part of Upper Canada, and deposits of shellmarl, which are abundant throughout the province, are used, in like manner as the plaster, for manuring the soil. The lithographic stone of Marmora has been already quarried, and applied, to some extent, for prints and maps, and millstones of excellent quality have been made from the millstone rock of the Eastern Townships, and from the granite of the Chaudière. Some of the marbles have also

been partially worked, and the clays are wrought in various places into bricks and tiles, and articles of common pottery ware.

Many other natural productions of the mine, however, will ere long contribute to add greatly to the increase of the wealth of Canada. In every direction, it is possessed of vast beds of iron ore of the finest quality, from the bog iron of the St Maurice forges to the specular iron of Lake Huron. Marmora, and Madoc, South Sherbrooke, Hull, the Wallace Mine, and McNab, themselves contain iron enough for the supply of a continent for ages. The mines of copper on Lakes Huron and Superior admit of being worked with profit to a much greater extent. Chromic iron, a very valuable material for the manufacture of the chromates of potass, and of lead, for dye and painters colours, and for glass staining, is found in large quantities in the Eastern Townships. Besides these, iron ochre, in the forms of yellow ochre, Spanish brown, &c., abounds in various localities, equal to the best imported from France into Britain, and there are inexhaustible supplies of white quartzose sandstone, as at Vaudreuil, admirably adapted as a material for flint glass. Sulphuret of zinc is found at Maimanse, Lake Superior, sulphuret of nickel on Lake Huron, and manganese in the Eastern Townships. Sulphate of baryta for permanent white paint, soapstone and plumbago for hearths and crucibles, and phosphate of lime for manure, and materials for roofing slates, wait only the growth of capital, and enterprize, to render them available for the supply of the country and for export. Marble of various colours from the coarsest to the finest quality, white, black, mottled, variegated white and green, verd antique, and serpentine of the

most beautiful descriptions, are found in numerous localities, and in great abundance. We might add to the above products of the mine other minerals, such as silver on Lake Superior, which may yet be obtained in workable quantity, valuable agates, and other precious stones, and building materials of various kinds. But our limits forbid, and we proceed to consider the--

3. *Third source of the natural wealth of Canada, its fisheries, or the produce of its seas and lakes.* From the Gulf of the St. Lawrence large quantities of dried and pickled, codfish salmon and herring, and from the lakes, white fish and trout, and other produce of the waters, are exported, over and above what supplies the home consumption. To such an extent is this trade increasing, that, while the value of these exports was, in 1850, only £36,521, it amounted, in 1852, to £74,462, or more than double that sum. The fisheries on the lakes are chiefly on the southwest of Prince Edward's District on Lake Ontario, and on Lake Huron, and furnished, in 1852, 11,884 barrels. In the Lower Province, they are carried on in Gaspé, the north side of the Bay of Chaleur, the Magdalen Islands, and the Coasts of Labrador. As the trade increases, the population in the lower part of the gulf will increase along with it, and, as their great place of trade is at Quebec, they will there exchange their fish and oil for the flour and other produce of Upper Canada, and the other necessaries which they require.

II. Having thus adverted to the natural productions of Canada, we have still to consider its industrial products of Agriculture, and Manufactures.

1. With regard, first, to those of agriculture, we begin with the live stock, and their produce, for the agricultural

state of a country can never be a prosperous one where the amount of these is small. The possession of a considerable number of animals on the farm is not only a source of wealth in itself from the butter, cheese, and wool which they afford, and from the surplus stock, but is an indispensable condition for the profitable following out of a proper rotation of crops, and for the due manuring, and thus sustaining and augmenting, the productive properties of the soil. It is, therefore, a symptom which augurs well for the future, that the live stock of the Province is being increased in a greater and greater ratio every year, notwithstanding all the demands for domestic consumption, and the large numbers annually exported. In 1852, the number of neat cattle, in Upper Canada, was 504,963, in 1846, 565,845, being an increase of 10 per cent in 6 years. In 1851, they amounted to 745,594 being an increase of 32 per cent in 3 years, or 64 per cent in 6. In 1842 the number of horses was 113,675; in 1848, 151,389 or 33 per cent more in 6 years. In 1851, their number was 203,300 being upwards of 33 per cent increase in 3, or 66 per cent in 6 years. In 1842, the number of sheep was 575,730, in 1848, 833,807, being 45 per cent more in 6 years. In 1851, their number was 959,222, or at the rate of 32 per cent increase in 6 years. In 1842, the number of hogs was 394,366; in 1848, 484,241, or an excess over that in 1842 by 23 per cent. In 1851, their numbers were 570,237, being at the rate of 36 per cent increase in 6 years. The total of live stock in Upper Canada, in 1851, was, therefore, 2,488,653, or nearly 3 to 1 of the population. In 1844, the whole number in Lower Canada was somewhat less, than that of Upper Canada in 1842, but it also has greatly increased, and in 1851, amounted to 1,654,773, or about two-thirds of that in the Upper

Province. The total estimated value of the live stock in the whole of Canada, in the same year, was £10,947,537, currency.

Great as this amount of stock is, it might yet be very much greater with advantage both to the farm and to the farmer, if hay, and particularly root crops, such as carrot, and mangel-wurzel, were more generally cultivated, especially in this section of the Province. In 1852, 39,762 animals, valued at £87,000 besides a nearly equal value of pickled and cured beef and pork, were exported. The increase in the export of pork is very remarkable. In 1850, it was only £7,374; in 1851, £17,992; in 1852, £54,487, more than seven times greater in two years. By much the largest amount of animals, and animal food, exported was from Canada West, and a very considerable portion of it from Kingston. The greater number of horses, however, were from Lower Canada. We must confess, that these are items of export, which we would rather see diminish, than increase, in localities where farms are often inadequately supplied with a sufficient number of stock to admit of their right cultivation, and for keeping the land properly manured and tilled. For instance, in the country around Kingston, stock, we are inclined to think, is too frequently parted with, where enough has not been left for the attainment of these ends, and, although we have some excellent agriculturists in the Midland District, yet for its general good farming, horses, cattle, and sheep, ought to be much more numerous than they are.

As might have been expected, the increase in the amount of the chief animal produce, butter, cheese, and wool, has been no less extraordinary than the increase of stock, and shows, in another point of view, of immediate interest, the

importance of keeping up, and augmenting the latter. In 1848, the number of lbs of butter made in Canada West was 3,380,406, in 1851 it was 15,976,315, or about five times greater in three years. In 1848, the number of lbs of cheese was 668,357, in 1851, it was 2,226,776. In 1842, the number of lbs of wool was 1,302,510; in 1851, 2,398,764. In 1851, the number of lbs of butter produced in Lower Canada was 9,637,152, of cheese, 511,011, and of wool 1,430,976. Of these products the butter chiefly is exported. In 1850, the value of the exports of butter was £30,817, in 1851, £65,600, in 1852, £102,959, or nearly quadrupled in two years. Some of the wool from the United States was declared by the Jurors at the Great Exhibition, in 1851, to approach nearly to the German wool in fineness, and the Canadian wool is also in general of excellent quality, and will become yet far more valuable, as the breed of sheep throughout the Province is improved. The amount of wool exported in 1852, was only £18,576, although the value of the whole produce of wool in 1851 was £413,073. Canada, in fact, already imports a considerable quantity of wool for the purposes of manufacture. In 1852, 169,915 lbs valued at £8,321 were imported of which £2,791 were from Britain, and £5,530 from the United States. Of the latter, Cobourg alone imported to the value of £2,634, and when we consider, that Canada, in the area at present settled, is rather an agricultural than a pastoral country, it is likely, that this importation will continue to increase, until the back ridges are opened up, and occupied by settlers who will devote their attention principally to the rearing of sheep, and other stock.

The total value of the animals, and their produce exported in 1852 was £295,929, while in 1850, it was only

£157,583, thus shewing, that the exports have nearly doubled in two years. All the former, and by far the larger portion of the latter were exported to the United States, to the amount of £241,549 of the whole sum now mentioned. The other North American Colonies took £43,574 of the remainder, and only £10,021 went to Britain.

2. But by far the greater portion of Candian products is vegetable, grains, fruits, and seeds. Canada is pre-eminently an agricultural country, from the rich flats on the south side of the St. Lawrence below Quebec, and those to the south of Montreal to the fertile regions of the west. Of 3,695,763 acres under cultivation in Canada West, 2,273,746 were under crop in 1852, while 1,365,556 were under pasture. The soil is in general good, so that the extent of wheat soil is proportionably greater than in the British Isles, which contain only about a third of the area, and in many parts it is of a deep loam, admirably adapted for the rearing of crops of every kind. The climate also, in consequence of the greater and more steady heat of summer, enables a greater variety of grains, roots, and fruits to come to perfection. In addition to the staples of British husbandry which are produced to a continually increasing amount, Maize is largely grown throughout the Province, while peaches, and grapes flourish in the western districts, and tobacco is raised in considerable quantities in Essex and in Kent.

The whole estimated value of the vegetable productions of agriculture, in 1851, was of grain £5,624,268, and of other vegetable products of the farm £3,564,521, in all £9,188,789. The total amount of these various products exported in 1852 was £1,181,363. In 1851, the wheat crop of Canada West was 12,692,852 bushels, or 13.33 for every inhabitant, while it was only 3.46 in Lower Canada, and, in

1850, only 4.33 in the United States to each of the population. The amount of wheat raised in Upper Canada has been nearly quadrupled within the last ten years. About an equal number of bushels of oats is reaped every year, and next to wheat and oats, peas, indian corn, potatoes, and turnips are most extensively cultivated. The amount of the crops of these, in 1851, displays the same astonishing increase as that of wheat. It is worthy of remark, however, that while the produce of wheat was four times greater in 1851, than in 1841, the proportion to each inhabitant was only doubled, thus showing, that the population had been growing during the interval with wonderful rapidity. The home consumption is further shewn to require a much larger portion of the wheat crop to meet its demands by the fact, that the exports of wheat and flour, are not being augmented to the degree in which they would have been, if the rate of increase of the population had been of an ordinary kind. Out of a crop of about 16,000,000 bushels, including the crops of Canada East and West, only about  $5\frac{1}{2}$  millions were exported in 1852, about  $10\frac{1}{2}$  millions, or at the rate of  $5\frac{1}{2}$  bushels for every inhabitant, being consumed in the country. The value, however of this exported surplus was upwards of £1,000,000, and the amount is being annually increased. And it is farther to be remarked, that the exports of wheat, as well as of other vegetable food, might be double, and even treble what they now are, if a system of more perfect farming, such as exists in Britain, were *more generally* pursued. In some counties of Canada West the average yield of wheat per acre is from 19 to 20 bushels, or even more, but the general average is only  $16\frac{1}{4}$ , and in Lower Canada only 7.2. I regret to find, that the County of Lennox, notwithstanding its excellent soil, has

the smallest average to the acre under wheat crop in Canada West, in 1851, being little more than 6 bushels to the acre, but I am glad to learn, that this was owing to the ravages of the weevil, which were very destructive in that quarter in that year. It is, however, certain, that, if the land be not imperfectly tilled, or exhausted by constant cropping, but be properly cultivated, and manured, it might, over the whole of Upper Canada, without difficulty, and to the great advantage of the farmer, yield an average of 25 or 30 bushels instead of 16.

Next to wheat, and besides large quantities of barley, rye and Indian corn, oats and peas are most largely produced and exported. In 1852, 641,616 bushels of oats, and 4,538 barrels of meal, and 239,601 bushels of peas, were exported to the estimated value of upwards of £80,000, and the amount is increasing every year. The peas and haricot beans of Canada are of very superior colour and quality, and, like the wheat, command a high price in the British market. The roots, especially these with tap roots, as carrots and mangel-wurzel, grow luxuriantly, and attain a great size. And scarcely any thing, with careful ploughing and manuring of the soil, would tend more to add to the resources of the Canadian farmer than their more extensive cultivation. The preparation of the land for such crops better fits it for succeeding crops of grain, while their culture enables the agriculturist to pursue a judicious system of rotation. They are more sure in their return than the turnip, and contain more nutritive matter for the keeping and fattening of stock, of which they enable the farmer to keep a greater number, and in better condition, and at less expence also, especially in such seasons as the present, than if they had been fed mostly on hay, or even on hay and straw. For milch cows

they are incomparably superior. The supply of milk and butter from cattle fed on carrots, or mangel wurzel, is both abundant and of the finest quality. But the cultivation of root crops is not only attended with great advantage to the general tillage of the land, and otherwise. It is absolutely essential to good farming anywhere, and especially in Canada, where the winter is longer and more severe than in Britain, and stock, therefore, can be pastured only during the summer. To farm at all well, or profitably, a sufficient number of stock must be kept to supply the necessary return of manure, and this can be accomplished only by raising a larger amount of roots.

Canadian hops were considered next to the British at the Great Exhibition in London, and 47,000 lbs were exported in 1852. 20,000 bushels of linseed, and 2,649 barrels of oilcake, also were exported in the same year, and it is evident from this, and from the excellent coarse linen made in Lower Canada, that flax is cultivated there to a small extent. But, upon the whole, the produce is comparatively insignificant. Indeed, instead of exporting, there was an importation of the raw material alone, of flax, hemp, and tow, chiefly for shipbuilding purposes, to the value of £17,552, of which £6,609 were from Britain, and £10,943 from the States, and, in 1851, the produce of flax and hemp together in Canada West was only 56,650 lbs, or about 25 tons.

Had Canada had a large stock of these materials now, in all probability, her fortune would have been made during the ensuing summer. In addition to about 20,000 tons of flax and hemp of home growth, about 80,000 tons are imported annually into the United Kingdom from other countries, and nearly 60,000 of these from Russia, the flax being

valued at from £40 to £180, sterling, and the hemp at £50 a ton. Besides this, more than 5 millions of bushels of linseed are in the list of British imports, of which 4,000,000 are from Russia, worth, at a dollar a bushel, £1,000,000, currency. The whole value of the produce of flax, and hemp, imported into Great Britain and Ireland from Russia alone is, therefore, in money value about £6,000,000 currency. These immense imports from Russia are now at an end for a time, and a most important source of revenue to the population and government of that country is cut off. This drying up of one of the mainsprings of their wealth by the earthquake commotions of war may perhaps, as much as any other circumstance, incline that ambitious power from the Czar, to the splendour and wealth of whose Court it ministered, to the peasantry, from whose small plots the exports of these materials were derived, to desire the cessation of a strife, on the part of Russia, at once the most unjust, and the most unprofitable. But, at all events, we may learn not lightly to overlook the benefits which she has so long enjoyed from her commerce in these articles, and in which we have every natural advantage for successfully competing with her. We have a better soil and climate, though of a similar kind. The fibre of Canadian flax has been ascertained to be of the best description, and the Society for the Encouragement of Arts, years ago, determined by actual experiment, that Canadian hemp is equal to that from the Baltic. All that is required is to have the fibre carefully and properly prepared by well known methods for that purpose, at a very small expense. There is scarcely any object connected with the agriculture, and the increase of the wealth of the country, which is so deserving, at the present moment, of the attention and

encouragement of the Provincial Government, or which can by its endeavours, and support, and by the intelligent energy of our farmers, be more easily attained. To such an extent have the wealth and prosperity of Belfast grown, that the tonnage entering that port has increased 925 per cent within the last 36 years, while that of Liverpool, the most rapid in its increase of the British ports, has risen only 558 per cent during the same period. The exports from the port of Belfast alone were nearly £8,000,000 in 1852, and its imports upwards of £7,000,000, while the exports from the whole of Canada during the same year were only three millions and a half, and the imports £5,000,000 currency. And all this is mainly due to the commerce of the North of Ireland in the raw material, and manufactures of flax.

Having thus considered that part of the industrial productions of Canada which consists of agricultural products, it remains for us to consider the *second* part of this branch of our subject, its Manufactures.

And, *first*, with regard to its manufactures of copper and iron. The Montreal Mining Company, (the proprietors of the Bruce Mines,) have erected a very complete establishment there for working the ores according to the mode practiced at Swansea, and now export both black and refined copper, as well as the ore itself, and for the specimens which they exhibited at the Great Exhibition in London one of the prize medals was awarded. For pig and other iron the Hon. J. Ferrier, the proprietor of the St. Maurice or Three Rivers Mines, also obtained a prize medal, and the Marmora Iron Company received an honorable mention. It is, therefore, much to be regretted, that while, during the year ended June 30th 1851, the United States, over and above their own consumption, exported

£54,000 currency of pig and bar iron, and nails, and £41,000 of castings, and above £550,000 of iron manufactures, or a total of £645,000 of domestic produce in iron, the whole produce of Canada, notwithstanding its vast mines, was very small, and its exports only to the value of £6063. To shew to what extent ores of iron are available as a means of increasing the resources of a country, we may just mention as a yet far more striking instance than that of the States, that, besides enormous quantities of steel and cast steel, pig iron alone was produced in Great Britain in 1351 to the amount of £5,400,000. Very little has yet been done to develop the peculiar capabilities of Canada for the production of iron, especially malleable iron, and steel of the finest quality. We are glad, however, to learn, that the works at Marmora are expected soon to be resumed under a company of large capital, that new erections are projected, and a foreman of the works has been appointed. A railway passing from Kingston towards Peterborough in the direction of the works, and connected with them by a branch, would soon, we believe, generate a trade in iron, which would yield a large return to the holders of its stock, and suffice to supply the wants of the railways, and machinery, the founderies, and workshops of Canada, and of Britain itself, for ages to come.

While the most important material employed in machinery is as yet produced only to a small amount in Canada, its manufactures of machines, whether for direct use, or for manufacturing purposes, are in a much more advanced state throughout the Province. In various places, there are large machine factories, and founderies, in which land and lake steam engines and water wheels, with all the heavy and other castings, and gearing, blast engines for fur-

naces, pumps, and fire engines, are made, and now locomotives, railway carriages, and waggons, are begun to be constructed at Montreal, Toronto, and Hamilton. Excellent and substantial work is turned out from these manufactories. Some of the fastest steamers on the lakes have been built on the British side, and as an instance worthy of notice of the skilful workmanship of our artizans we may recall to your recollection, that Mr. Perry, of Montreal, gained the first prize in London in 1851 for the best fire engine, after a comparative trial with some of the most celebrated English, and foreign makers. The ingenuity of its construction, and its great power, were equally admired.

Besides these manufactures in iron, axes, planes, and other edge tools, of superior quality, together with excellent scythes from Melbourne in the Lower Province, are made in large quantities. In addition to stoves of every kind, spades, shovels, and nails are made in various places, and at Gananoque, where these are also manufactured, a factory for the making of screw nails, the first established in Canada, will soon be in operation. Ploughs, harrows, cultivators, thrashing, and separating machines, and other agricultural implements of the most approved construction, are further mostly supplied by the handicraft of the Province itself.

Last, though not least of the manufactures in metal, we may mention, that excellent types are cast in Montreal, and stereotype plates for printing.

Next to machines made for direct use are those manufactured for manufacturing purposes, especially grist, and saw mills, which are very numerous, and some upon the largest scale. The saw mills in particular on the Ottawa, and at Chicoutimi are perhaps the largest in the world. The whole number of grist mills in Canada West alone in

1851, was 610, 41 of which were driven by steam, and producing in all about 1,800,000 barrels of flour yearly. The number of the saw mills in Canada West, in the same year, was 1618, ( of which 169 were propelled by steam,) producing during the year upwards of 400,000,000 of feet of wood.

The manufacture of philosophical, surgical, and musical instruments is yet in its infancy. But that of musical instruments has already been begun with some success both in Montreal, and in Canada West.

The making of woven fabrics of cotton was carried on in 1852, to a very small extent however, in a factory near the Welland Canal, and also in Sherbrooke in Canada East. The manufactures of linen are more considerable, but are almost wholly confined to the Lower Province, which produced about 900,000 yards in 1851, and to coarse articles, and are not, we believe, increasing.

Woollen fabrics, and mixed fabrics of wool and cotton, blankets, flannel, woollen cloth for wearing apparel of substantial texture, tweeds, and satinets are largely manufactured, chiefly in Canada West, and machine made hosiery is now wrought at the Mills of Mr. Lee, of Niagara. Carding and fulling mills, and cloth factories, are very numerous, and out of a produce, in 1851, of 698,764 lbs of wool, 310,890, together with 170,000 lbs imported, or nearly 500,000 lbs of wool in all, were manufactured into woollen stuffs within the Province. The quality of the fabric thus wrought is being improved every year. The blankets from Dundas are already highly thought of and gained the first prize in the late Exhibition at New York, and Cobourg, in which one factory employs 175 hands, and turns out 800 yards a day, is celebrated for the amount and excellence of its cloths ;

Every thing indeed, indicates, that Canada is destined to become distinguished for its manufactures in wool, and even to export them to other countries.

Another branch of manufacture which is carried on to a very large extent is that of leather, for which the comparative cheapness of the hides, and the abundance of oak and hemlock bark, obtained from the timber, afford unusual facilities. One firm in this neighbourhood, the Messrs. Miller, are very extensively engaged in this business. The imports of unmanufactured leather, therefore, in 1852, were only £15,302, shewing that the home supply was nearly sufficient to meet the demand for home consumption. Carriage, sleigh, and other harness, sleigh robes, and furs, are also manufactured within the Province in a very workmanlike manner, and to a considerable amount.

Among the manufactures in timber, ship building occupies the first place, and is carried on chiefly at Quebec, and Kingston. Forty-eight ships with a tonnage of 48,675 tons, and valued at £486,750 were built at Quebec during the last year, to 26 in 1852, valued at £262,600. This branch of business in our good city promises to become one of no small importance, and already the ships built in this port are celebrated for their substantial make, and excellent sailing qualities. Two large vessels, each of about 800 tons burden for ocean navigation, besides others, are now on the stocks in the ship yard of our worthy fellow citizen, Mr. Counter. In addition to this manufacture on a great scale, there are numerous factories for chairs, and general house furniture, for sash making, for the making of lasts, and pegs, staves, pails, rakes, scythe-handles, and other useful articles in wood.

To these are to be added manufactures of excellent writ-

ing, printing, and wrapping paper, good flint glass, plaster of Paris, earthen and pottery ware, bricks and tiles, soap and candles, on a very large scale, in Montreal and Toronto, maple sugar to the extent of 7,000,000 lbs., valued at the rate of 4d. a lb., at £162,870, or more than one-half of the consumption of West India sugar, wood, vinegar, charcoal, linseed oil, and manufactures in straw, which last are already exported to the States to a considerable amount.

We would willingly dilate on some of these particulars, did your time permit, but enough has been said to shew that the march of improvement has begun, and is steadily advancing.

Such are the natural, and industrial productions of Canada. Yet, however great its natural capabilities, they will never be rightly developed, nor will its wealth and prosperity ever greatly increase, if we depend on these alone. The real foundations for its future prosperity, as they must be for that of any country, are the education, religion, and morality of its people. The Indian once roamed the same land, and knew little of the riches of the soil which lay beneath his feet, or the wealth of the forest which stretched around. But when an educated, and enterprising race, trained to the arts of a civilized life, came in, these riches began to be appreciated, and the fruits of intelligent labour yielded an abundant return. The same education, and intelligence, are necessary now to perpetuate the advantages thus reaped, and a much greater and more general advancement, in these qualifications is required, in order that the progress of the country may be as decided as it may, and ought to be. The spread of education will soon tell with almost inconceivable power on the returns of the natural productions realized, and of the industrial products, of Canada. Even the universal

possession of a knowledge of the most ordinary branches of instruction will be itself of the utmost benefit. The ability to read enables a man to obtain information with regard to the facts which are of the greatest importance to be known in the business in which he is engaged, and opens up to him more widely the field of the experience, and observation, of others. Indeed without this he would become, in so far, almost like the inferior creation, who have no accumulated treasures of knowledge either of the present or of the past, and whose narrow compass of intelligence has continued the same from time immemorial. An acquaintance with arithmetic enables a man to calculate for himself, and understand the calculations of others, in matters in which he is nearly interested. And the ability to write enables him to note down his observations for his own future use, and to communicate their results to others. But the improvements which have been made during the last, and especially since the beginning of the present century, in agriculture, and in the arts, and manufactures, depend so much on a knowledge of the principles especially of Natural Philosophy, and Chemistry, that to carry these improvements into successful operation requires an acquaintance not only with the ordinary branches of a common education, for that of course is indispensable as the first step to knowledge, but also with the leading facts, and laws, of physical and chemical science, or at least with the practical rules which have been derived from them. The Agriculturist will then cultivate his farm more skilfully, and more profitably to himself, and the Engineer, the Manufacturer and the Artizan will be prepared for engaging in their work more intelligently, and efficiently. And, what will not be the least advantage, the minds of many will be stimulated to reason, and form

inductions and deductions of their own ; a general spirit of enterprise will be awakened, and the inventive faculties will be called into play. Watt had received a good education, and could not have made the discoveries he did without it, and ere long, we may hope, some Canadian Watt, nurtured in our schools and colleges, will arise to do honour to his country, and to benefit the world. George Stephenson, the celebrated Engineer, whose locomotive gained the prize from the Directors of the Liverpool and Manchester Railway, altho' he had not been wholly an uneducated man, yet felt the disadvantages of the imperfection of his early instruction so much, that, in the evenings, after his ordinary work, he employed himself in mending his neighbours clocks and watches, in order that he might give a good education to his son Robert. For this purpose Robert was sent, at the age of ten, to the Academy in Newcastle, where he continued until nearly sixteen. He then, for a short time, received private lessons from Mr. Riddell, (afterwards headmaster of the Royal Naval School of Greenwich,) after which he attended at the University of Edinburgh the lectures of Professor Leslie in Natural Philosophy, Dr. Hope in Chemistry, and Professor Jamieson in Natural History. During most of this time, excepting during his absence in Edinburgh, he was the assistant and companion of his father, and the work of mutual instruction went on, until the father attained the highest distinction among the benefactors of his country, and, from the son of a collier, picking dross from coal heaps at two pence a day, became possessed of a large locomotive manufactory at Newcastle, and an extensive owner of collieries, and iron works. And his son Robert is now a member of Parliament, and enjoys the well merited reputation of the first engineer of the age.

Similar may be expected to be the effects of the spread both of a common, and of a higher education in Canada. It must, therefore, afford peculiar gratification to all who desire to see its more yet rapid advancement, and more extended resources, to know, that its educational interests have not, especially of late years, been neglected. Besides endowments, and grants to Universities, Colleges, Grammar, and Normal Schools, and others within the Province to a large amount, £41,095 17s 10d is given by Parliamentary grant for the annual support of the Common Schools of Canada West and East, and is divided between the two according to their population, each school municipality being bound to raise at least as much by local rate as it receives from the government allowance. The amount realized from the local assessment in Upper Canada greatly exceeds the minimum required. In addition to these, school rates are levied in each school section for the support of the teacher, and it is pleasing to know, on comparing the sums raised for the support of Common Schools in 1851, in the State of New York, with the sums applied in Canada West to the same purpose, that while the population of the former was four times greater than that of Upper Canada, the amount expended by the former was only three times greater than that expended by the latter. Another circumstance, also worthy of notice, is, that, while the percentage of those from five to sixteen years of age attending school was somewhat greater in the State of New York than in Upper Canada, the proportion in Canada West had gradually increased from 1 in 7 in 1842 to nearly 1 in 5 in 1851, and while the average period during which the schools were kept open in New York State was only 7 months and 17 days, in Upper Canada it was 9 months and 28 days, or about

one-third longer. The comparison with the Western States is still more favorable to Canada, but we are as yet considerably behind Massachusetts both in the sum applied to educational purposes, and in the extent to which school education is carried. The whole number of District, Grammar, Common, and Private Schools, in 1851, in Canada West, was 3,230 attended by more than 175,000 out a population of 950,551. The proportion of those from 5 to 16 years of age attending Common Schools in Lower Canada appears, according to the latest and still imperfect returns, to be less than one half of that in Upper Canada.

We may here mention, that we observe with regret, from the returns of 1851, that the proportion of those between the ages of 5 and 16, attending the Common Schools in Kingston, Frontenac, and Lenox, is considerably less than in many other parts of the Province, and in Kingston the instruction seems to be more confined to elementary branches than in Toronto, where a larger proportion of the scholars are taught Geography, and the Elements of Geometry, and Algebra, and few or none, it would appear from the returns, are taught in the Common Schools of our good city, the Elements of Natural Philosophy, Vocal Music, and other branches of instruction, while many receive instruction in such branches in Toronto and Hamilton. Private Academies also were more numerous in proportion to the population in those cities, than in Kingston. We trust, that either some omission has occurred in the returns, or that, since 1851, matters have in these respects improved, for one of those things which most tends to elevate the position of a city, as well as of a country, is a high standard of education in its citizens, and we earnestly hope, that what is needful to be done to bring it up to its due completeness among us will soon be carried into effect.

An education of a higher kind is productive of many advantages to the community, and country, in which it prevails. A well educated people is much more easily governed than a rude, and ignorant population, and, although the expenditure required for public instruction may be considerable, yet both the private wealth, and the public revenue, will be improved by the people receiving a higher education, while the State will derive honor by having in it men of its own who have risen to distinction in literature, and science. We cannot forbear expressing our conviction, however humiliating the confession, that as yet a much larger portion of the youth of the New England States receive a higher education than in Canada West. But we are at the same time convinced, that, in the movement in this direction which has now begun, a wide field of usefulness and advancement lies before the Higher Schools, and Universities of Canada. Many who have once tasted the pleasures of learning will not rest, until they have made those farther attainments which lead to eminence. And as our population increases in intelligence, and wealth, they will more and more perceive, that knowledge is power, and earnestly desire for their children, and their country, the benefits of an education of the most perfect and solid kind.

The education of the intellect, however, important and essential as it is, as a foundation of a nation's progress, is not the only one. The blessing of God alone maketh rich, and without that religious instruction which elevates the motives, and inspires with the truest patriotism, which restrains from vice, and prompts to justice, truth, and benevolence, between man and man, the most essential element for a nation's prosperity is still wanting. There must be a people, not only of learning and intelligence, but of Christian worth and

integrity, and Canada must seek her brightest ornament, the best safeguard of her happiness, and the surest source of her future eminence, in the piety and morality of her population. Let a wise and virtuous race of her sons arise, and a righteous government will rule for the good of its subjects, and its statutes will be cheerfully obeyed, the authority of the law will be maintained, and the rights of property will be secure, good order, and freedom without license, will prevail, her name will command the respect of other countries, her credit will be extended and upheld, and capital will be freely invested for her benefit. How earnest, therefore, ought we to be, that the moral field, as well as the natural soil, may be more extensively and perfectly cultured, and that there may be more universally diffused throughout the land the blessings of our common Christianity, which not only restore men to holiness and peace with their God, but confer so many and so signal moral benefits on the country in which it prevails, and its elevating and purifying tendencies are widely felt "Then shall the Earth yield her increase, and God, even our God, shall bless us."

THE END.

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