

"Its common rise is one inch per day, and it never averages over three inches in twenty-four hours for any number of days in succession. Its rise to high-water mark, stand and subsequent fall, occur every year at nearly the same dates with the utmost regularity." Trout Lake, four miles east of Lake Nipissing, on the headwaters of the Mattawa, is the summit-level, being about 23 feet higher than Lake Nipissing. It is  $8\frac{1}{2}$  miles long, and one mile wide, and could not furnish water enough for even a less scale of navigation than the one required. To overcome this difficulty, Mr. Shanly proposed to raise Lake Nipissing to the same level, an expedient now clearly impracticable, since it would drown the town of North Bay and flood the Canadian Pacific tracks for miles. Mr. Clarke's plan contemplated the elevation of the surface of Lake Nipissing nine feet only; but in a very recent report on the undertaking, Marcus Smith, C.E., suggests that the object in view can be best achieved by raising Nipissing merely five feet, and lowering Trout and Turtle Lakes to that level. This presumably would flood little land of value, and would only tend to increase the excavation at the summit ridge. The result would be to give a continuous summit-level 58 miles in length, with a catchment basin eighty miles long, and from half a mile to twelve miles broad, making a surface of 330 square miles. Lake Nipissing, a magnificent body of water 40 miles long and from 12 to 18 in breadth, and copiously fed from streams of large size, would thus become the summit feeder, and furnish a supply of water practicably inexhaustible.

"An alternative plan, which would not call for any interference with the existing level of Lake Nipissing, and would probably be much cheaper, is advanced by Mr. Smith. This consists in diverting a portion of the waters of Sturgeon River to Trout Lake, leaving that the summit level, and overcoming the lift by additional locks. But his own preference is decidedly with the formation of a long level by bringing the three lakes to the same height. A short distance from the shore the waters of Trout Lake are of great depth, so that lowering it 18 feet will not affect its navigation. Immediately below, and separated from it by a rocky bar of 400 feet in length, is Turtle Lake, only one foot lower than Trout Lake. It is  $4\frac{1}{4}$  miles long, and in it there are some detached shoals extending in all over about 1,500 feet, and chiefly composed of needle rocks, having seldom less than eight feet of water over them. With these exceptions the depth throughout is rarely less than 18 feet, and generally over 30 feet. The average width of the lakes is about a mile."

The main question then becomes one of the amount of excavation of the summit ridge required. Here, again, nature has signally favored the Ottawa route. The amount of cutting needed on the Toronto and Georgian Bay line is practically prohibitory of that route, but the Ottawa watershed affords a happy contrast in that respect. The facts may be best stated in the words of Mr. Smith's report already referred to: "The distance from Lake Nipissing to Trout Lake by the little river Ojibwaysippi is a little over four miles, of which, for over three miles, the land is little, if any, higher than near the shore of Lake Nipissing. Then for continuing the canal on the same level as Lake Nipissing when raised five feet, and for giving a clear depth of water of at least ten feet, as proposed by Mr. Shanly, the depth of cutting for probably  $3\frac{1}{2}$  miles in length would average twelve feet. On the next half or

three-quarters of a mile to Trout Lake the land rises to very little above the level of that lake and is marshy. The maximum depth of cutting would be about thirty feet, the major part of which would most probably be in crystalline rock."

Thus it will be seen that there is to be dealt with in this case a *summit ridge rising only about four feet above the existing summit water level, and that for a distance of less than a mile.*

Ideal terminal facilities on Georgian Bay are afforded by the harbor at the mouth of the French River. A thorough hydrographic survey of that part of Lake Huron was completed in 1894, and lights have been placed in position marking the channel to the entrance of the river, which the steamers of the North Shore Navigation Company now ascend to the foot of the first rapids. The harbor is formed by the sheltering group of Bustard Islands to the southwest and a high promontory to the northwest affording admirable protection from the violent autumnal gales, and is both safe and commodious. Doubtless some rocks would require to be removed, but, generally speaking, Mr. Shanly says that it fulfils all the conditions of a noble harbor. At its eastern extremity the route debouches upon Lake St. Louis, gaining entrance to Montreal harbor by the Lachine Canal. An alternative route would be, as suggested by H. K. Wicksteed, *via* the Black River, which would perhaps be preferable as giving Montreal, like New York, a double water frontage, and thereby affording greatly increased and much needed additional harbor accommodation. Water supply, summit ridge cutting, terminal facilities, and general character of the route being thus all alike favorable to the consummation of the undertaking, there remains the question of cost of construction and time required for same.

Mr. Shanly's plan contemplated the construction of 58 miles of canal with a ten-foot channel, and his estimate of cost (made in 1858) was \$24,000,000, or upwards of \$370,000 per mile, while he states the cost of the St. Lawrence canals as then built to have been \$150,000 per mile. His reasons for this high estimate were: the hard, unyielding nature of the materials to be worked upon; the distance which materials for building the locks would have to be carried; the great cost of transporting materials, plant, and supplies to a large portion of the route, "with no roads, and in a wilderness without inhabitants." Since the railroad now runs contiguous to 380 out of the 430 miles of the entire distance, the last named difficulty has been greatly lessened, as the second has also been, by the discovery in several instances of fine building stone at no great distance from the works. Improvements in machinery and methods have materially reduced, too, the importance of the remaining cause of expense, namely, the hardness of the rock encountered. A further lowering of his figures will result from making a deduction for the 8.50 miles of the Lachine Canal, the cost of which was included in his estimate, but which has since been constructed by the Dominion Government. That would leave 50 miles at \$370,000 per mile, equal \$18,500,000. From this Mr. Smith deducts for improved facilities afforded by the construction of the Canadian Pacific Railway and improvements in machinery, etc., 20 per cent., or \$3,700,000, leaving \$14,800,000 as the total cost on Mr. Shanly's plan.

Mr. Clarke recommended damming the river more freely wherever the shores were steep and little land of any value would be flooded, and thus made 20.82 miles