

Economic and Strategic Aspects of Enlargement of Welland Canal and of Construction of Georgian Bay Ship Canal.

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This is a most important subject for debate by the Canadian Society of Civil Engineers, because it involves vitally the probability of continued existence of our international boundary, as well as the question of the economic expenditure of vast sums of money, and because it is a question that should be solved by civil engineers. Internationally, the question involves the use of constricted waterways at Sault Ste. Marie, St. Clair River, Detroit River, Welland Canal and St. Lawrence River by both peoples, some of which waterways are on one side of the boundary and some on the other, and the effect of such a condition in case of friction unhappily arising between Canada and the United States. Commercially, the economics of the projects can be compared with transportation by rail and with one another. The expenditure involved and where it is spent, and the effect of the expenditure upon the country as a whole, are most important. Civil engineers alone can make the surveys and determine the physical possibilities of construction, the cost of construction, and the relative engineering advantages or disadvantages in the construction, maintenance and operation, as compared with railway transportation on the one hand, and the one canal project with the other on the other hand. This question is apparently of such wide scope, and involves technical detailed knowledge of so great variety that the writer submits it affords ground for much valuable discussion, which it is to be hoped will be elicited by this admittedly imperfect and faulty paper, contributed with diffidence, but in good faith, by the writer as his view.

The present canal system of commercial importance consists of:—

- Sault Ste. Marie Locks:—
 - 1—on Canadian side 900 x 60 x 19 ft. draft being operated.
 - 1—on United States side 600 x 100 x 14 ft. draft being operated.
 - 1—on United States side, 800 x 100 x 19 ft. draft being operated.
 - 1—on United States side 1,250 x 80 x 24½ ft. draft, opened Oct. 21, 1914.
 - 1—on United States side expected to be ready in two or three years.
- Channels in United States territory below locks at Sault.
- Channels in Canada and United States in St. Clair River.
- Channels in Canada and United States in Detroit River.
- Welland Canal, including 24 locks, 270 x 45 x 14 ft. draft.
- St. Lawrence canal system, 26 locks, 270 x 45 x 14 ft. draft.

After the war of 1812 the British Government, recognizing the necessity of having a line of communication for military purposes away from the boundary, canalized the Ottawa River from Montreal to Ottawa, and the Rideau and Cataraqui Rivers from Ottawa to Kingston for barges drawing 5 ft. of water, at a cost of \$3,911,700, which system they subsequently gave to Canada free of cost. These last two systems, however, interesting to the summer tourist as canoe and yachting routes, are not of great economic or strategic importance under modern conditions. The cost, maintenance, operation and repairs for the year 1913 was \$309,822.65, and the tonnage passing through (mainly pleasure boats, cordwood, lumber and sand) amounted to 227,023 tons.

About 1904 the Dominion Govern-

ment's Public Work Department started a survey of the Ottawa-French River route for the purpose of arriving at the cost of a 22 ft. ship canal. The result is embodied in a very voluminous report, dated 1908, including estimates as follows:—

Total length of canal.....	440 miles, including:—
Free navigation.....	346 miles
Improved channels.....	66 miles
Excavated canal.....	28 miles

Total	440 miles, 22 ft. deep.
Costing	\$100,000,000.00

The system is estimated to be capable of developing 1,000,000 h.p. on the direct canal route, and this estimate might probably be doubled by figuring the power developed in regulating the tributary streams.

It is significant that about the same time the Department of Railways and Canals commenced to make surveys to determine the possibility of enlarging the Welland Canal from the present 14 ft. draft to 30 ft. These surveys were completed in 1913 and the parliamentary estimate for that year included \$2,000,000 for the enlargement of the Welland Canal and \$5,000,000 for canalizing the French River from Georgian Bay to Lake Nipissing. The total estimate of the cost of enlarging the Welland Canal, 26 miles, is reported to be \$50,000,000, probably two-thirds of which will be expended in the United States for fuel and machinery, and in various foreign countries in the form of wages sent home by laborers. The lift of 325 ft. is overcome by 7 locks of 46.5 ft. lift, 800 ft. long x 80 ft. wide x 30 ft. draft.

The St. Lawrence Canals enlargement has not been surveyed and no information is therefore available to indicate whether corresponding enlargement to suit that at the Welland Canal is physically possible at any cost of construction, and the people of Canada have not been informed of any treaty with the United States sanctioning such deepening of international dams, etc.

During 1913-14 contracts were let for construction of about 10 miles of the the Welland Ship Canal, including all the locks, at a cost of probably \$35,000,000 and the work of excavation is possibly half done.

Internationally considered, this question is of supreme national importance, as involving such questions as national defence and the very possibility of holding Canada for the Empire. In this connection, it must be borne in mind that New York State is enlarging the Erie Canal from Troy to Oswego and to Buffalo, from 6 or 7 ft. draft to 12 ft. with a lock length of 311 ft., and width of 45 ft., to accommodate barges of 1,500 tons capacity, and these canals will open Lakes Ontario and Erie to formidable U.S. war vessels, giving them absolute control of these lakes at all times, unless Canada be supplied with similar transport facilities apart from the boundary waters of the St. Lawrence River from Kingston to Prescott. The enlargement of the Welland Canal will also carry a great preponderance of large U.S. steel freighters into Lake Ontario, thus giving to that country an undisputed control of that lake. Canada has enjoyed a century of peace with her powerful southern neighbor, and it is the wish of all good

citizens to enjoy another one, even avoiding in the coming century such incidents as the Trent affair, the Fenian raids, Venezuela messages and the Panama Canal question, and serious boundary disputes, fishery disputes, international water power questions, etc., to say nothing of United States Senate Reports, 1889-1890 (testimony of Joseph Nimmo, Jr.), etc. Such questions having arisen in the past, however, they will naturally arise in the future, and the peaceful settlement of them depends largely upon the temper and temptations at the time. So long as an international boundary is to be retained, so long should the policy of Canada be to preserve peace while safeguarding her honor and interests.

It is not apparent to the public that this canal problem, probably Canada's most expensive commercial project under construction, has been considered by the Canadian people from the national point of view, though pamphlets have been published ad nauseam by boards of trade of various municipalities treating the subject in a spirit of parochial politics, each exaggerating the advantages of one route and the disadvantages of the other, the very apparent incentive in each case being the expenditure of public money on the construction in the immediate vicinity of the municipalities interested. If the question be approached from a purely economic point of view, it is probable that freight (and grain from the prairies to the Atlantic seaboard in Canada is the most important commodity at present) can most cheaply be handled by rail from Winnipeg to Fort William and Port Arthur, by ship to Georgian Bay, and by rail over a direct line with easy gradients to Montreal, cheaper than by any canal at present built or proposed. On this route the C.P.R. has a double track from the west to Fort William; the Grand Trunk Pacific and the Canadian Northern have each a single track between the same points. There is a large fleet of U.S. steamships engaged in the coal, grain and ore trade on the lakes, and the Canadian fleet is growing rapidly. The C.P.R. has a line with easy gradients from Port McNicoll, on Georgian Bay, where it has built large grain elevators, to connect with its Toronto-Montreal line, with a view to carrying grain in competition with the canals, and it probably has estimates of comparative cost warranting the expenditure, even under the unequal conditions that the traffic by the railway must pay interest, depreciation and upkeep, while the Government assumes these enormous sums in the case of the waterways, making the canals free to all ships alike, Canadian and foreign.

The people are educated to demand water transportation "to regulate rail freights," and to what extent a larger canal than the present 14 ft. Welland-St. Lawrence system will result in a reduction of rates is a question that can be figured in many different ways with varying results. Figures have been prepared by competent authorities showing that the maximum saving in freight on wheat from Fort William to Montreal by the enlargement of the Welland Canal will be ¾c. a bushel, which will amount to \$187,500 a year on 50,000,000 bushels at a cost in interest on \$50,000,000, of say