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The Canadian Society of Civil Engineers

INCORPORATED 1887.

ADVANCE PROOF—(*Subject to revision*)

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A SHORT SKETCH OF THE DEVELOPMENT OF TRANSPORTATION FACILITIES IN CANADA.

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(To be read at the monthly meeting of the Society, December 14th, 1911.)

In the eighteenth century the population of Canada was confined to the banks of the rivers and the shores of the lakes, and the price of the small amount of supplies required was largely composed of the cost of transportation in canoes in summer and shoulder packs in winter. In the course of time small canals, sufficient for canoes, were made around some of the rapids of the St. Lawrence and the Ottawa Rivers to avoid the most difficult portaging, and as the settlements spread back of the rivers, trails were cut through the forests and pack horses were introduced. Then followed corduroy roads and carts and sleighs. As the population increased, graded, and in some cases, macadamized roads were made, and here and there light draft canals.

In the year 1779 the Coteau du Lac and the Split Rock Canals around some rapids in the St. Lawrence River were undertaken, with locks 20 ft. long, 6 ft. wide, and 2 ft. of water. These were opened in 1780. Then came the Cascade Canal of the same dimensions, begun in 1782 and opened the next year, at the junction of the St. Lawrence and Ottawa Rivers. These canals were operated with good results until 1814, when their enlargement was undertaken. The work was completed in 1817, the locks having been widened from 6 ft. to 12 ft., the length and depth remaining as before.

With a view to improving the facilities of transportation by water, the following canals were built and opened, viz.:—

Transportation

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The Vaudreuil Canal, near Vaudreuil, was commenced in the year 1814 and opened in 1816. Its lock was 100 ft. long, 32 ft. wide, with 5 ft. of water.

The Lachine Canal around the Lachine Rapids of the St. Lawrence River, $8\frac{1}{2}$ miles in length with locks 108 ft. long, 20 ft. wide, and 4 ft. 6 in. of water, was commenced in the year 1821 and completed in 1824.

The Welland Canal, $26\frac{3}{4}$ miles in length, connecting Lakes Erie and Ontario, first built by a company, was commenced in 1824 and opened in 1833. The locks of this canal were 100 ft. long, 22 ft. wide, with 8 ft. 6 in. of water.

The Carillon and Grenville Canals on the Ottawa River were commenced in 1825, and opened in 1833. The length of the Carillon Canal was $2\frac{1}{4}$ miles, the locks being 126 ft. 6 in. long and 32 ft. 6 in. wide, with 6 ft. 6 in. of water. The length of the Grenville Canal was $5\frac{3}{4}$ miles, with locks 106 ft. long, 19 ft. wide, with 6 ft. 6 in. of water.

The Rideau Canal, $126\frac{1}{4}$ miles in length, connecting Ottawa and Kingston, built by the Imperial Government, was commenced in 1825 and opened in 1832. Its locks were 133 ft. long, 33 ft. wide, with 5 ft. 6 in. of water.

The Trent Canal was designed to extend from Trenton on Lake Ontario to the Georgian Bay, Lake Huron. The Bobcaygeon section built by the Imperial Government, with lock 134 ft. long, 33 ft. wide, and 5 ft. of water, was commenced in 1833 and opened in 1835.

The Cornwall Canal on the St. Lawrence River at Cornwall, $11\frac{1}{2}$ miles in length with locks 200 ft. long, 45 ft. wide, and 9 ft. of water, was commenced in 1834 and opened in 1843.

These improvements did not appear to meet the demands of trade or satisfy the commercial interests. The difficulties and cost of transportation continued to be a great hindrance to trade development and to the advancement of the country.

With a view to improving matters in this regard, it was determined to extend and improve the canal system of the inland navigation, and also to test the question as to whether or not transportation by rail was adapted to the carrying trade of the country. In 1836, therefore, a short line of railway, known as the Champlain and St. Lawrence Railway, extending from Laprairie to St. John's, in the Province of Quebec, a distance of 16 miles, was built and opened for traffic. Previous to this not a mile of railway in British North America, now the Dominion of Canada, had been built.

This may be said to be the commencement of the era of railways in Canada, and so doubtful did the problem appear at that time, that it was more than a decade before capitalists could be induced to embark further in extending the railway system. But

even though investors appeared still to be timid in this respect, they ventured to invest in the enterprise of constructing a section of the St. Lawrence and Atlantic Railway, extending from Longueuil, opposite Montreal, to St. Hyacinthe—30 miles, and the Montreal and Lachine Railway—8 miles, both of which were put in operation in 1847, making a total mileage of 54 miles under traffic at the end of that year.

Nothing further, however, was done until the year 1850, when the St. Lawrence and Industry Railway, from L'Epiphanie to Joliette, in the Province of Quebec—12 miles—was opened for public traffic. This made a total mileage in operation at the 30th June, 1850, of 66 miles, all of which was in the Province of Quebec, showing an increase in the decade ended on the 30th of June, 1850, of 50 miles.

The experiment of the introduction of railways in Canada as a means of transportation appeared to satisfy capitalists, who had watched the results, and taking courage, they embarked in an extension of the Champlain and St. Lawrence Railway from St. John's to Rouses Point, Laprairie Junction to St. Lambert, and Montreal to Brousseau—51 miles; also in the construction of the Ottawa and Prescott Railway, from Ottawa to Prescott—59 miles; the Lake St. Louis and Province Line Railway, from Iberville to Highgate Springs—29 miles; making a total mileage of 205 miles under traffic at the close of the year 1852.

In the year 1852 the author was on the engineering staff of the Toronto and Hamilton Railway as Assistant Engineer on the survey for that line preparatory to its construction. It was a very important line of railway designed to connect the city of Toronto with that of Hamilton, the two leading commercial centres in Upper Canada. At that time there were only 205 miles of railways in Canada.

So firmly set in the public mind and that of financiers did the success of the experiment of the introduction of railways in Canada become, that about this time the Erie and Niagara Railway, the Great Western Railway, the Grand Trunk Railway, and the Northern Railway were financed, and construction was undertaken. It was pointed out that the latter road would pierce a forest country, sparsely settled, and with no immediate prospect of a return for the capital invested therein; hence it was more difficult to finance than the two other roads, but through the energy, perseverance and earnestness displayed in the project by the late Mr. Capreol and Mr. (now Sir) Sandford Fleming, its construction was undertaken. There was, however, a desire to keep the expenditure down as low as possible, resulting in a rather temporary work; nevertheless, it served a good purpose until the country through which it passed developed sufficiently to warrant its being rebuilt a few years later.

The Great Western Railway and the Grand Trunk Railway were

enterprises which, it was felt, could not be otherwise than a great boon to those engaged in trade throughout the country, and to the development of the country generally. This has proved to be the case, although perhaps disastrous to the original shareholders.

In 1855, the year in which the railway between Toronto and Hamilton was completed and opened for traffic, sections of the Great Western Railway and Grand Trunk Railway were put in operation, making a total mileage of 876 miles of railways in operation in Canada in 1855; then followed the construction of the Toronto Esplanade, giving an entrance to and passage through the city of Toronto for the Great Western, Grand Trunk, Northern and other railways

At this time great activity was displayed in the extension of railway construction in Canada; the mileage of railways in operation on the 30th of June 1860, having reached 2,065 miles, of which 1,253 miles were in Ontario, all of which is an increase; 624 miles in Quebec, an increase of 558 miles; 98 miles in New Brunswick, all of which is an increase; 90 miles in Nova Scotia, all of which is an increase; making a total increase of 1,999 miles, in the decade ended 30th of June, 1860.

During the construction of the Grand Trunk, Great Western and Northern Railways, the business of the country became inflated, owing to the heavy expenditure of money in connection with these roads. Upon their completion and the consequent ceasing of the large expenditure which had been going on, a sharp depression in trade set in, and for a few years trade was dull; however, owing to the facilities of transportation given by the railways, business soon revived, but for a few years there was little done in railway construction.

From 1860 to 1870 matters were very quiet as regards railway construction. The total mileage of railways in operation on the 30th of June, 1870, was 2,617 miles, of which 1,358 miles were in Ontario, an increase of 105 miles; 720 miles in Quebec, an increase of 96 miles; 310 miles in New Brunswick, an increase of 212 miles; 229 miles in Nova Scotia, an increase of 139 miles; making a total increase of 552 miles in the decade ended June 30th, 1870.

The year 1870 may be considered as an earnest commencement of railway construction in Canada; it was about this time that the Dominion Government began the construction of the Intercolonial Railway, which led in the mileage constructed in the following decade.

Before the construction of this road was commenced there was a battle of routes, but finally it was decided to take the northern route, even though it was longer than the interior one. The road was built as a military line, well away from the International Boundary, and not as a commercial dividend-paying enterprise. Its ob-

ject was to unite the several Provinces in the Dominion of Canada by a band of steel.

It may not perhaps be considered out of place to remark that Mr. (now Sir) Sandford Fleming was engaged during this decade in having most exhaustive surveys made for the Canadian Pacific Railway across the continent, as well as in obtaining information as to the general character of the country, its resources and its soil. All this work was performed in a most able manner; his writings upon the subject have proved to be most valuable for reference, the information therein contained having been found to be strictly correct.

The result was that in the year 1874 it was determined to construct the road as a public work, and between 1876 and 1880 the following sections were put under contract:—

Ontario—323.

Fort William to Winnipeg 427 miles.

Manitoba—104.

Winnipeg westward 100 "

Emerson Branch 65 "

British Columbia—Savonas Ferry to Port Moody . . 213 "

Making a total of 805 "

The works of construction were commenced at once but no part of the line was completed during the decade ended 1880.

In the year 1880, upon a reconsideration of the matter, it was concluded that the cost of construction of this road as a public work would be a serious burden upon the country; accordingly negotiations were commenced with a syndicate of Canadian capitalists for its construction and operation, but no final arrangement had been reached upon the close of the year ended 30th of June, 1880.

At the close of the year 30th of June, 1880, there were 7,194 miles of railway opened for traffic in Canada, of which 3,553 miles were in Ontario, an increase of 2,195 miles; 1,865 miles in Quebec, an increase of 1,145 miles; 922 miles in New Brunswick, an increase of 612 miles; 490 miles in Nova Scotia, an increase of 261 miles; 198 miles in Prince Edward Island, all of which is an increase; 166 miles in Manitoba, all of which is an increase; making a total increase of 4,577 miles in the decade ended the 30th of June, 1880.

In 1881 arrangements were concluded with a syndicate of capitalists for the construction of the sections of the Canadian Pacific Railway, from Calendar to Fort William, 650 miles, and from Winnipeg to Savonas Ferry, 1,258 miles, making a total of 1,908 miles; also for the operation of the entire railway under conditions,

no doubt, well known to all. It was at this time said by able authorities and others, that it would not pay for the grease on its wheels, and what the result of its operation would be, was, to a majority of minds, very problematical.

Numerous difficulties were encountered during its construction, all of which were overcome. The road was completed in 5 years instead of 10 years as called for by the contract, this being very largely due to the energy, determination and skill of Mr. (now Sir) William Van Horne, then General Manager.

Its construction, instead of being a financial failure, has been a marvellous success, and in so far as the development of the country is concerned, through the enterprise of its management, it has far surpassed all expectation, and has caused a wilderness to blossom as the rose.

The success of this road, no doubt, induced the enterprising contracting firm of Messrs. Mackenzie and Mann to undertake the construction of the Canadian Northern Railway.

At the close of the year on the 30th of June, 1890, there were 13,151 miles of railway, of which 5,842 miles were in Ontario, an increase of 2,289 miles; 2,612 miles in Quebec, an increase of 747 miles; 1,333 miles in New Brunswick, an increase of 411 miles; 524 miles in Nova Scotia, an increase of 34 miles; 210 miles in Prince Edward Island, an increase of 12 miles; 1,049 miles in Manitoba, an increase of 883 miles; 490 miles in Saskatchewan, all of which is an increase; 333 miles in Alberta, all of which is an increase; 758 miles in British Columbia, all of which is an increase; making a total increase of 5,957 miles in the decade ended the 30th of June, 1890.

The Canadian Pacific Railway has been specially mentioned as being at that date, as it is to-day, an important factor in the Canadian Railway system, and also on account of the extent of its road opened for traffic during that decade, viz.:—2,676 miles.

During the decade 1890 to 1900, although the number of railways under construction had increased, the gross mileage built and put in operation during that time was less than in the previous decade. The total mileage in operation on the 30th of June, 1890, was 17,657 miles, of which 6,700 miles were in Ontario, an increase of 858 miles; 3,533 miles in Quebec, an increase of 921 miles; 1,457 miles in New Brunswick, an increase of 124 miles; 912 miles in Nova Scotia, an increase of 388 miles; 210 miles in Prince Edward Island, showing no increase; 1,421 miles in Manitoba, an increase of 372 miles; 1,194 miles in Saskatchewan, an increase of 704 miles; 879 miles in Alberta, an increase of 546 miles; 1,286 miles in British Columbia, an increase of 528 miles; 65 miles in Yukon, all an increase; making a total increase of 4,506 miles in the decade ended the 30th of June, 1900.

At the commencement of the decade of 1900 the grain growers of the Northwestern country and others complained that the existing railways were not handling the business offering with reasonable dispatch, and that as this Northwestern country was rapidly being settled, year by year, with its new land and new districts out of reasonable reach of existing railway facilities, further railway extension was much needed through that country. The question was promptly taken in hand by the Government, and in the year 1903, the Grand Trunk Pacific Railway Company was chartered, and a contract was entered into with them for a high standard railway under certain conditions set forth in the Act of Parliament and the agreement embodied therein, for the construction and operation of a line of railway from Moncton in New Brunswick to Prince Rupert on the Pacific Coast.

In the year 1905, the works of construction were commenced and have since been carried on with some degree of vigor, but no portion of the road had been operated as a company's line up to the 30th of June, 1910.

The total mileage of railways in operation on the 30th of June, 1910, was 24,727 miles, of which 8,230 miles were in Ontario, an increase of 1,530 miles; 3,793 miles in Quebec, an increase of 260 miles; 1,522 miles in New Brunswick, an increase of 65 miles; 1,350 miles in Nova Scotia, an increase of 438 miles; 269 miles in Prince Edward Island, an increase of 59 miles; 3,220 miles in Manitoba, an increase of 1,799 miles; 2,932 miles in Saskatchewan, an increase of 1,738 miles; 1,488 miles in Alberta, an increase of 546 miles; 91 miles in Yukon, an increase of 26 miles; making a total increase of 7,070 miles in the decade ended the 30th of June, 1910.

In the early days in Canada it was difficult to obtain money with which to construct the railways, especially in cases where the railways ran through sparsely settled districts and a return for the investment could not be expected for some years. For this reason, many of our railways were constructed of a temporary character, requiring the structures to be rebuilt in a few years. This, however, appears to have been a wise policy, as the less the road cost in first construction, so much less revenue was required to pay dividends for some years until the country was settled and the traffic increased, when a road would be in a position to increase its capital expenditure in making renewals and improvements. Even at the present day it is, perhaps, wise in cases in which railways are being built through a country difficult of access and where immediate traffic would be light and the cost of the transportation of permanent structural material very heavy, to make comprehensive plans in the first instance for present and for future requirements, and to use the less costly and less permanent material in construction; by

this means accommodation in the way of works for the immediate business would be provided, and improvements could be made and the facilities for traffic increased as the business of the road developed.

As it has been already stated it had been determined to continue to improve the inland navigation by extending and improving the canal system since the introduction of railways in 1836. To this end a number of additional canals have been built, and many of the old ones enlarged as became necessary from time to time to meet the demands of the carrying trade and the development of the country. Amongst these canals may be mentioned those forming the route from Montreal by way of the St. Lawrence River, Lake Ontario, Niagara River across the neck of land from Port Dalhousie to Port Colbourne on Lake Erie, Lake Erie, St. Mary's River, and Lake Superior to Port Arthur, the head of the great lakes.

MONTREAL TO PORT ARTHUR.

The first enlargement of the Lachine Canal was commenced in 1843 and completed in 1848. The length of locks was increased from 108 ft. to 200 ft., and the width from 20 ft. to 45 ft., with an increase of water from 4 ft. 6 in. to 9 ft.

The second and last enlargement was commenced in 1873 and completed in 1885, increasing the size of the locks from 200 ft. in length to 270 ft., the width unchanged, with 14 ft. of water.

The Beauharnois Canal, 11½ miles in length, with locks 200 ft. long, 45 ft. wide, and 9 ft. of water, was commenced in 1842 and opened in 1845. This canal was abandoned in 1900, upon the opening of the Soulanges Canal.

The Soulanges Canal, 14 miles in length, extending from Cascade Point to Lake St. Francis, was commenced in 1892, and completed in 1900. The locks were 270 ft. long, 45 ft. wide, with 15 ft. of water.

The Cornwall Canal enlargement was commenced in 1876 and completed in 1904. The locks were increased in length from 200 ft. to 270 ft., with no change in the width, and from 9 ft. to 14 ft. of water.

The building of the Williamsburg Canals, which included the Farrans Point, Rapide Plat and Galops sections, was commenced in 1843 and completed in 1847, with locks 200 ft. long, 45 ft. wide, and 9 ft. of water. The enlargement of these canals was commenced in 1888 and completed in 1904. The locks were increased in dimensions to a minimum of 270 ft. in length, no change in width, and 14 ft. of water. A 14 ft. channel was cut between, near the upper end of these canals towards Prescott.

The first enlargement of the Welland Canal was commenced in 1842 and completed in 1848, including the size of 24 of the locks

from 110 ft. to 150 ft. in length, the width from 22 ft. to 26 ft. 6 in., and water from 8 ft. 6 in. to 10 ft. 3 in. deep; one lock from 110 ft. to 230 ft. in length, and two locks from 110 ft. to 200 ft. in length.

The second enlargement was commenced in 1874 with 12 ft. of water. This work was not fully carried out, and a third enlargement was commenced in 1878 and completed in 1904, increasing the length of the locks to 270 ft., with a width of 45 ft., and 14 ft. of water.

The Sault Ste. Marie Canal was commenced in 1888 and completed in 1895. The lock was 900 ft. long, 60 ft. wide, with 20 ft. 3 in. of water.

This gave a minimum depth of 14 ft. of water throughout from Montreal to Port Arthur on Lake Superior, with a minimum length of lock of 270 ft., and a minimum width of 45 ft.

Wherever the depth of water is mentioned, the depth of water on the mitre sill of the locks is meant.

MONTREAL TO KINGSTON, *via* OTTAWA.

The canal route from Montreal *via* Ottawa to Kingston is by the Lachine, Ste. Anne's lock on the Ottawa River at Ste. Anne, the Carillon and Grenville Canals, and the Rideau Canal.

The Lachine Canal has already been described. The Ste. Anne's lock, $\frac{1}{2}$ mile in length, was commenced in 1840 and opened in 1843, with a lock of 200 ft. long, 45 ft. wide, and 9 ft. of water. The Carillon and Grenville Canals and the Rideau Canal have also been described. Ottawa is reached by these canals with 9 ft. of water, and Kingston with 6 ft. of water.

CHAMBLY BASIN TO ST. JOHN'S.

The Chambly Canal, Chambly Basin to St. John's—12 miles—was commenced in 1831 and opened in 1843. The locks were 120 ft. long, 24 ft. wide, and 6 ft. of water.

The St. Ours' lock on the same route— $\frac{1}{2}$ mile—with locks 120 ft. long, 20 ft. wide, and 5 ft. of water, was commenced in 1844, and opened in 1849.

The Trent Canal was commenced by the Imperial Government building the lock at Bobcaygeon, which was completed in 1835. The Province of Upper Canada continued the work from 1840 to 1867, having built three locks between Chisholm's Rapids and Peterborough, since when the Ontario Government has built two locks between Peterborough and Balsam Lake. These two latter have since been enlarged by the Dominion Government, which has constructed 17 ordinary locks and 2 hydraulic lift locks between Chisholm's Rapids and Lake Simcoe. The lift lock at Peterborough has a lift of 65 ft., and the other at Kirkfield has a lift of 50 ft. 6

in. The dimensions of the locks are 133 ft. long, 33 ft. wide, with 6 ft. of water, making a clear 6 ft. navigation between Chisholm's Rapids and Lake Simcoe. The work of completing the two terminal sections—Trenton on Lake Ontario to Chisholm's Rapids, and Lake Simcoe to Georgian Bay on Lake Huron is under construction. When completed, there will be a 6 ft. navigation from Lake Ontario to Lake Huron.

Whilst it will be generally conceded that the railways have been the chief factor in the development of the country, no doubt the canal system has in no small degree contributed to the improved condition of the carrying trade; in fact the canals did much in the early settlement of the country towards its development before transportation by rail was even considered.

The author has been identified with the railway system of the country since the year 1852, and with the construction of the Soulanges and Sault Ste. Marie Canals, as well as the enlargement of the canals, from the time of assuming the duties of the office of Deputy Minister and Chief Engineer of the Department of Railways and Canals in 1892, until his retirement from that office in 1905, to become General Consulting Engineer to the Dominion Government. Thus he very naturally has taken an interest not only in the development of land carriage, but also in the inland water transportation.

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