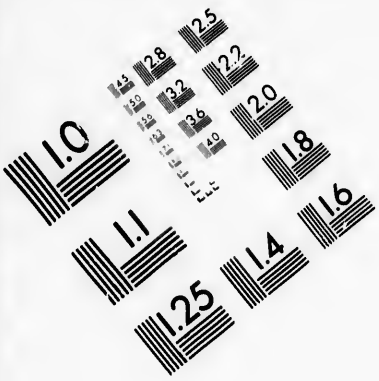

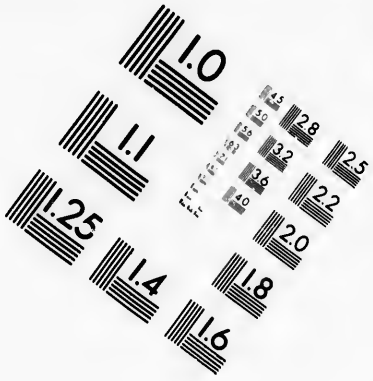

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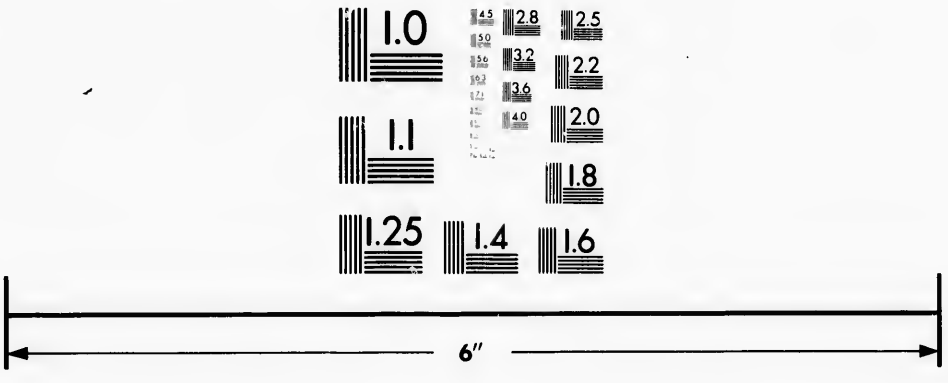

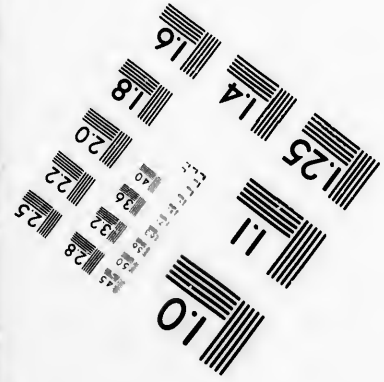

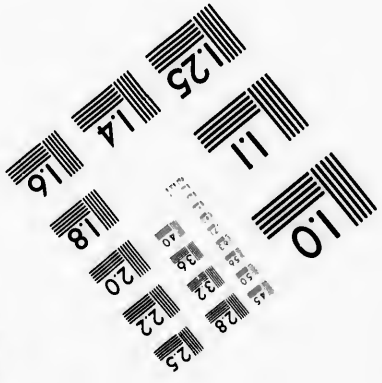

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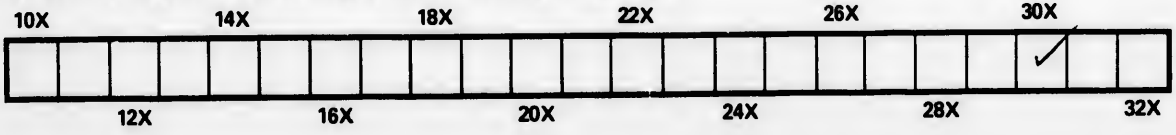

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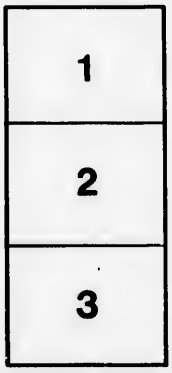
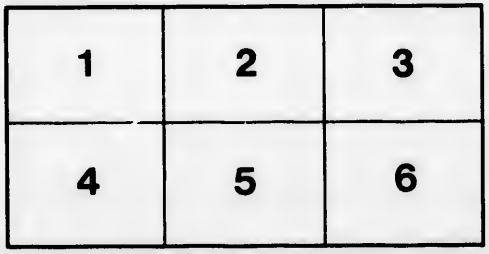




32X

PROSPECTUS

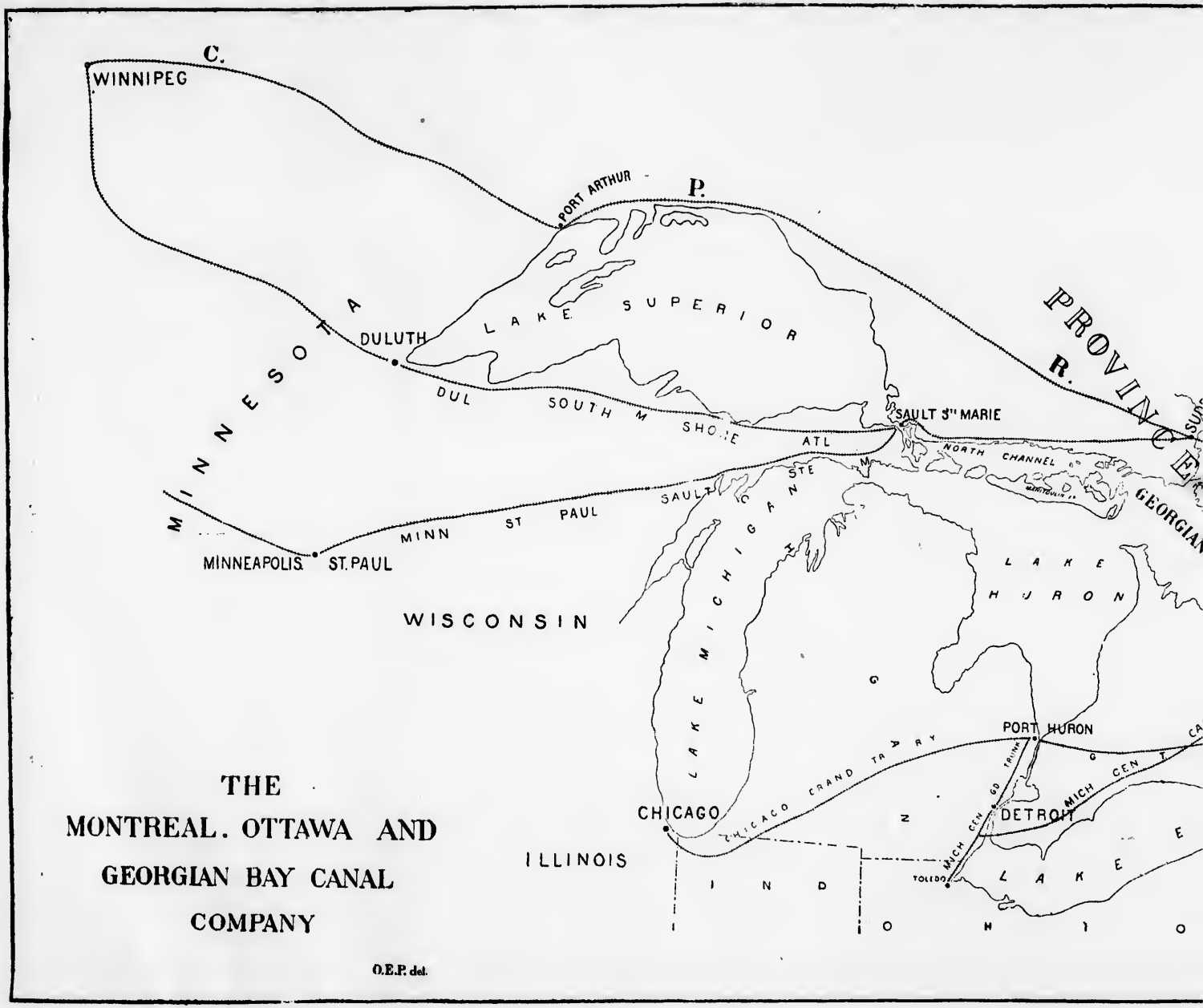
OF THE

Montreal, Ottawa and Georgian Bay

CANAL COMPANY

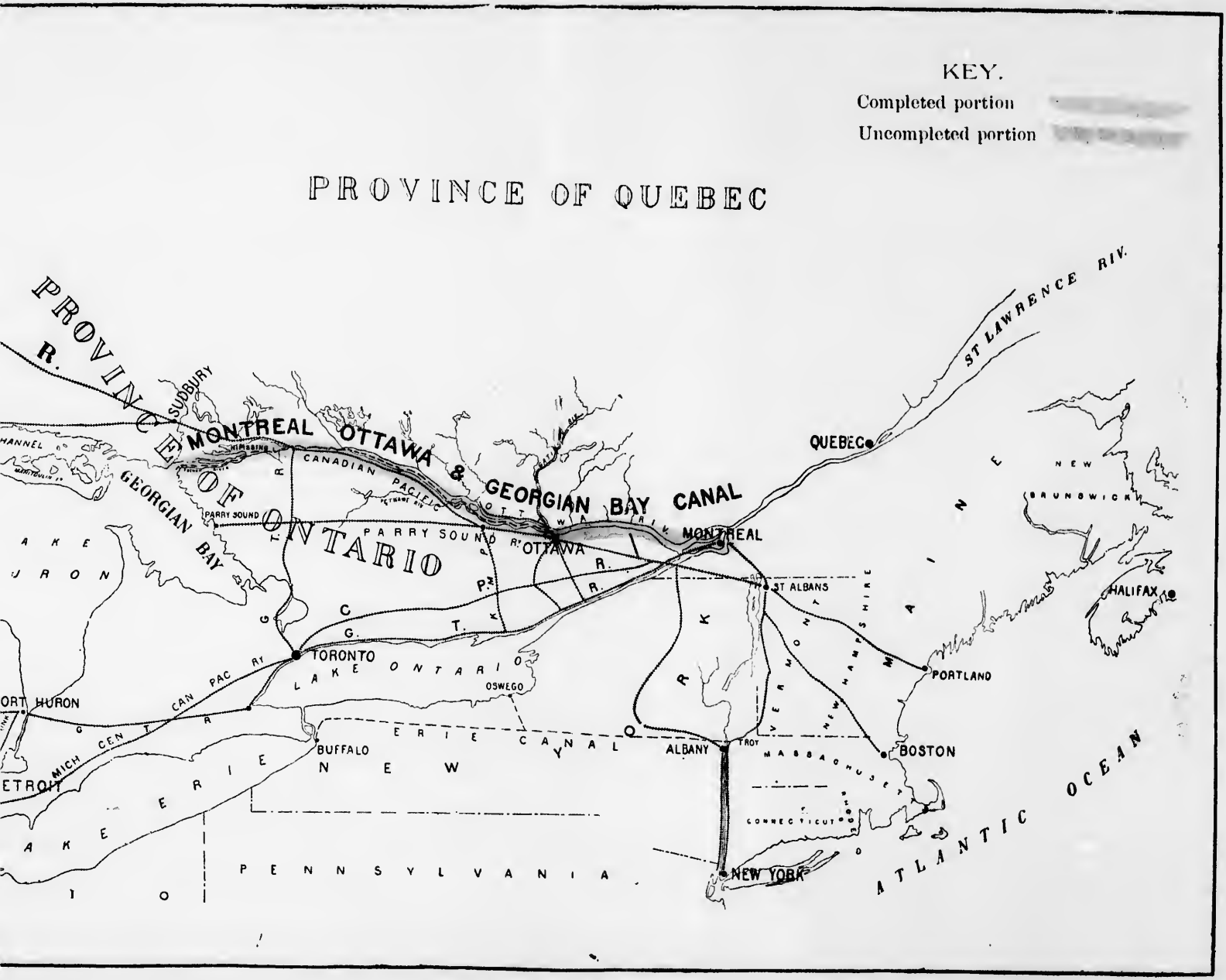
"CANADA LIES DIRECTLY ACROSS THE LEADING ROUTE FROM THE FAR WEST TO THE ATLANTIC SEABOARD, AND OVER SOME PORTION OF OUR TERRITORY THE GREAT TIDE OF WESTERN COMMERCE MUST FOREVER ROLL."

1895
(101)



THE MONTREAL. OTTAWA AND GEORGIAN BAY CANAL COMPANY

O.E.P. del.


KEY.
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CANADIAN PACIFIC
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PARRY SOUND
SUDBURY
NIPISSING
TORONTO
LAKE ONTARIO
OSWEGO
BUFFALO
ERIE CANAL
ALBANY
TROY
QUEBEC
ST LAWRENCE RIV.
MONTREAL
OTTAWA
ST ALBANS
PORTLAND
BOSTON
HALIFAX
NEW BRUNSWICK
NEW YORK
ATLANTIC OCEAN
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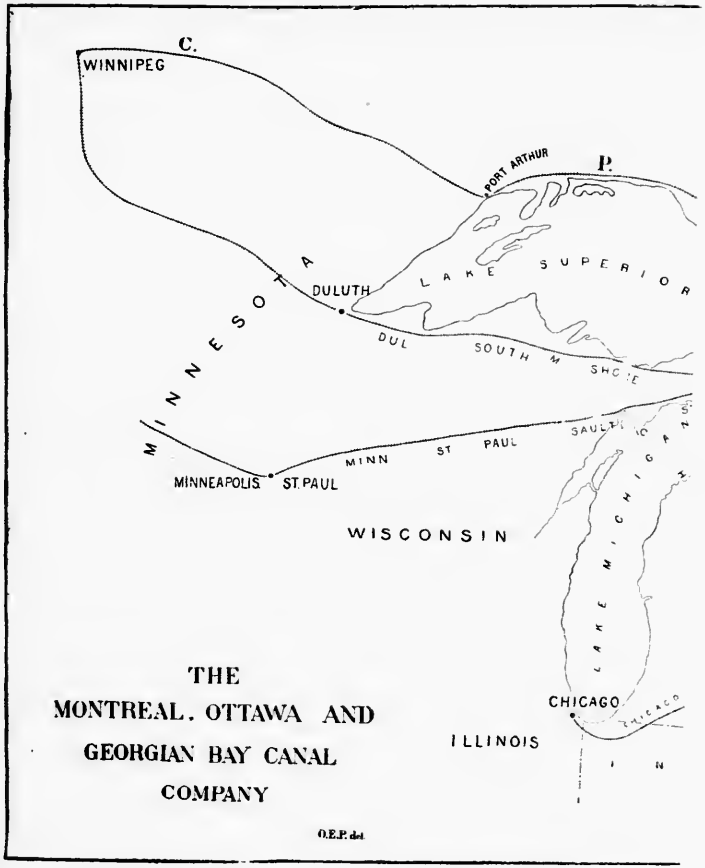
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LAKE MICHIGAN
CHICAGO
ILLINOIS
THE
MONTREAL. OTTAWA AND
GEORGIAN BAY CANAL
COMPANY
O.E.P. del

Purpose of formation of Company.

THIS Company has been formed for the purpose of laying out, constructing, maintaining and operating a system of canals necessary to the completion of a through waterway via French River, Lake Nipissing, and the Mattawa and Ottawa Rivers from the eastern side of Georgian Bay to the head of Atlantic Ocean navigation at Montreal.

Powers.

Among other powers conferred by the incorporating Act (57 and 58 Vic. Cap. 103), the Company are thereby enabledand authorized to

—lay out, construct, maintain and operate canals of such dimensions as to make and construct a navigable channel of at least nine feet in depth between the said terminal points together with such locks, dams, towpaths, branches, basins, feeders, reservoirs, cuttings, apparatus, appliances and machinery as may be desirable or necessary,

—take lands necessary or proper,

—maintain and alter any places or passages over, under or through such canals or any of their branches or connections,

—take water supply sufficient to maintain a current at the rate on the average of three miles per hour through the navigable channels of said canals,

—construct,maintain and operate,use,lease or otherwise dispose of terminals harbors, wharves, docks, piers, elevators and warehouses upon said canals, or upon land adjoining or near the same,

—lay out and lease or other otherwise dispose of water lots, and use, sell, lease, or otherwise dispose of water brought by or for said canals or works but not requisite for the same, and produce, lease, supply or otherwise dispose of hydraulic, electric and other kinds of power in connection with the works authorized, and to

—build,acquire and dispose of steamers,tugs,boats, barges, and other vessels for the purposes of said canal, and propel vessels of all kinds in and through said canals by any power or force.

Existing commerce of the Great Lakes.

The Great Lakes, with a coastline of 4,000 miles and an area of 95,060 square miles, afford the largest system of deep water inland navigation on the globe. Lying in a general direction east and west between the 41st and 47th parallels of latitude the system extends from tide water on the St. Lawrence, 900 miles west of the Straits of Belle Isle, 1,400 miles farther into the heart of the continent; Port Arthur and Montreal being on the northern, and Chicago and New York on the southern parallel. Its western extremity is only 1,700 miles from the waters of the Pacific, and for one-half the distance between the two oceans these waters divide the Dominion from the United States; while they lie wholly along the line on which population most freely moves westward, where final settlement is most compact, and where the climatic conditions insure the largest returns to capital and labor. Vast wealth is already centred in the territory surrounding them, and incalculably rich resources remain still undeveloped. Of 448 cities in the United States having a population of 8,000 or over and a total population of 18,234,385, no less then 204 with a total population of 10,137,747 are found in the eight states bordering upon the Lakes; while of these latter 57 containing 3,184,357 people are within the limits of a 50-mile zone encircling them. The cities of this region must eventually be the greatest centres of wealth and population in the country; and the natural pathway of their products and those of the vast country beyond them must ever be through the Great Lakes to the East.

Already an enormous traffic has been developed. Upwards of 22,000,000 tons of freight pass Detroit annually. Over 10,000,000 tons a year pass through the Sault Ste. Marie canal connecting Lake Superior with Lake Huron. In 1878, 1,091 vessels entered the Sault canal; in 1889, no less than

9,579, of which 6,587 were steamers; and in 1892 the number had increased to 12,580. In 1856, the registered tonnage using the canal was 101,458 tons; in 1889, 7,221,935 tons, the actual tonnage being 300,000 tons in excess of that figure; while in 1892, it had risen to 11,214,333 tons. In 1889, the total tonnage passed through the Suez canal was 5,903,024 tons, or only 80% of that using the Sault canal. On account of the opening of the Sault canal the development of Lake Superior's commerce has been exceptionally rapid, increasing as it has from 2,029,000 tons in 1882 to 9,041,213 tons in 1890.

The total ton-mileage carried on the Great Lakes in 1889 was 15,518,360,000 ton-miles, being 22-6 *per cent of the total ton-mileage* (68,727,223,146) *of all the railways in the United States* for the year ending June 30th, 1889. In 1886 there were but 6 steel vessels afloat on the lakes with a tonnage of 6,459 tons, and a value of $694,000. In 1890 there were 68 vessels of the same class of 99,457 tons burthen and valued at $11,964,000: showing an increase during four years in number of vessels of that class of 1,033·33 per cent.; in tonnage of 1,439·82 per cent.; and in value of 1,623·99 per cent.

To connect this traffic with the Atlantic Ocean the existing waterways are the Erie canal through the State of New York, and the St. Lawrence River and system of canals reached from the upper lakes by means of the Welland canal. A few brief comparisons will serve to shew the superiority of the Ottawa route over either of these.

Ottawa route the best commercial route.

1. All traffic from Lake Michigan ports as well as that from Lake Superior must go north to latitude 46, entering upon the same course as the latter at a point not far from the Saulte Ste Marie. Thence both the St. Lawrence and Erie routes are deflected southward to latitude 41, while the Ottawa waterway *lies almost directly along the 46th parallel from that common point to Montreal*; the ocean ports of the several routes being Montreal and New York in latitudes 46 and 41 respectively. The Ottawa route, avoiding the sinuosities of the lower portions of the other two, takes *the most direct course possible to tide water.*

1. Most direct.

Mr. T. Law Crawford, writing with regard to the proposed Forth and Clyde Ship Canal, says: "If a straight line be drawn across a map of the world on Mercator's projection, from a point at the entrance to the Baltic Sea to the mouth of the River St. Lawrence, it will be found that the line passes almost parallel with and in close proximity to the proposed Forth and Clyde Ship Canal. *The entrances to the Baltic Sea and the River St. Lawrence form the respective gateways to the markets of the interior of Northern Europe and Northern America.*"

The opening up of the Ottawa route would complete a direct and unbroken navigation along the continuation of such line for 2,000 miles into the heart of the Western continent, and would thus form an important link in the greatest of international waterways.

2. Owing to its directness this route effects a saving in distance between western lake ports and ocean navigation of almost 450 miles over the Erie, and 375 over the St. Lawrence. Thus from Chicago to Montreal is

2. Shortest.

via the St. Lawrence	1,348	miles
" " Ottawa	980	"
	368	"

while from Chicago to

New York via the Erie route is	1,415	miles
Montreal via the Ottawa "	980	"
	435	"

It is 575 miles from the entrance of Lake Michigan to Buffalo,(which port of transhipment is 495 miles from an ocean port); while the total distance from the same point of departure to the head of ocean navigation at Montreal via the Ottawa is only 635 miles. In other words a vessel leaving Chicago would reach the Atlantic market at Montreal in fifty or sixty miles more than it now takes her to reach Buffalo.

The distances between Chicago and Liverpool by the several routes are as follows:—

1. Via Erie canal,

Chicago to Buffalo.....	920	miles
Erie canal to Albany.....	350	"
Hudson River to New York...	145	"
New York to Liverpool.....	3,080	"
	4,495	"

2. Via the St. Lawrence,

Chicago to Montreal.....	1,348	miles
Montreal to Liverpool	2,800	"
	4,148	"

3. Via the Ottawa,

Chicago to Montreal	980	miles
Montreal to Liverpool.....	2,800	"
	3,780	

or over 700 miles less via the Ottawa route than by way of the Erie.

Least canalling required.

3. Less canalling is required on the Ottawa route than on any other. According to the plan submitted by Mr. T. C. Clarke, C. E, only 29 miles of canal are necessary on this route as against 71 on the St. Lawrence and 351 on the Erie. Estimating one mile of canal navigation as equivalent in point of expense and delay involved to three miles of open river and lake navigation, the routes will compare as follows:—

From Chicago to Atlantic tide water, via

1. Ottawa route, 980 miles,	(951+(29×3)	87)	equivalent to	1,038	}	miles of open river and lake navigation.
2. St. Lawrence 1,348 "	(1,277+(71×3)	213)	"	1,490		
3, Erie, 1,415 "	(1 064+(351×3)	1,053	"	2,117		

Quickest.

4. Calculating the average rate of travel at 4 miles per hour for canal and 12 miles for open river and lake, the time consumed on the several trips will, be, (allowing for lockage at the rate of 1½ minutes per foot).

1. Via Erie to New York,

	miles		hrs.	mins.
Lake and river.....	1,064		88	40
Canal...	351	(655 ft lockage)	104	05
Total			192	45

2. Via St. Lawrence to Montreal,

	miles		hrs.	mins.
Lake and river.....	1,277		106	25
Canal.....	71	(553 ft. lockage)	31	35
Total.....			138	

3. Via Ottawa to Montreal,

	miles	hrs.	mins.
Lake and river.....	951	79	15
Canal.	29 (666 ft. lockage)	23	55
Total.....		103	10

shewing a saving of nearly *four days* over the Erie route and *one and one-half days* over the St. Lawrence.

The importance of this element cannot be over-estimated. It has been well said by a writer on the merits of the route, "In the present age it will not do to expend as much time in running a cargo to New York by one route as it would take to reach Liverpool by another." While a cargo of grain shipped by the southerly route is losing nearly five days in passing through the 350 miles of the Erie canal, another shipped at the same time via the Ottawa would be well across the Atlantic on its way to Liverpool.

So great a saving of time on each trip will permit a larger number of trips to be made during the season than by any other route. Mr. Shanly has estimated this gain at two full additional trips, while others have thought three probable. The season on the Erie route is somewhat longer, but since Montreal is practically the most northerly point on the system, the length of season during which the Ottawa canals will be open will be about the same as that of the Sault Ste. Marie Canal, or an average of 210 days in the year. The proportion of work in hauling of freight to amount of capital invested in shipping, elevators etc., being materially increased by the added trips possible, there will be an important *lowering of rates of transportation* from this source.

Cheapest.

5. The vital necessity of the grain export trade is the cheaper transportation which the Ottawa route can alone afford. Although the bulk of freight carried by railroads annually increases, and with it their expenditures, yet the amount of service required to be performed to ensure the same return grows proportionally larger, so that the "additional receipts have failed to yield any additional profits." A succinct explanation of this fact is offered by Mr. J. Law Crawford when he says "the root of the disease lies in the carriage of heavy non-remunerative freight." It is this heavy and cheaply-carried freight that adds most to the railroad's expense for maintenance, rolling-stock, etc., and taxes it's capacity to the utmost, while making no corresponding addition to dividends. And it is precisely in relieving of railroads from this non-remunerative traffic that waterways have their most important function. For freight can always be conveyed by waterways at about one-third the cost of railway transportation. While the average freight rates per ton-mile on seven leading trunk lines of railway in the United States between Chicago and the sea-board declined from 29 mills in 1865 to 6 mills in 1888, lake rates have sunk as low as one mill per ton-mile and river rates to twice that. And though freight has been carried at the lowest remunerative prices under existing conditions, and even sometimes at heavy loss owing to ruinous competition, in 1893 the average freight rate on American railroads was 9 mills per ton-mile, and that on eighteen of the principal roads 8 mills. The average rates on wheat from Chicago to New York by the several American routes for the last eight years have been:—

1. Via Lakes and Erie canal.....	6·19	cents per bushel
2. Via Lakes and rail	8·96	"
3. Via all rail routes.....	14·55	"

Making all due allowance for lack of return freights at the outset it is calculated that wheat should be laid down in Montreal by the Ottawa route at a cost for transportation from Chicago not to exceed three and one-half cents

per bushel, or two and one-half cents per bushel less than the lowest prevailing rates. Experienced forwarders have estimated that a rate of one and three-quarter cents per bushel between French River and Montreal will afford remunerative employment to fleets consisting each of a powerful steam tug with convoy of three barges having a combined capacity of 180,000 bushels. This added to a rate of 1¼ cents (or about 1 mill per ton-mile from Chicago to French River) would give a through rate of only *three cents*, or nearly six cents a bushel less than the average cost of transportation to Buffalo by the Lakes and thence to New York by rail.

Safest.

6. In addition to all other advantages the Ottawa route is safer than any other and freight carried through it will be subjected to the least risk possible. From the mouth of Lake Michigan vessels will pass under the shelter of Manitoulin Island to the mouth of French River, avoiding altogether the dangers of southern Lake Huron, the shallow and dangerous Lake Erie, Lake Ontario, and the currents and shoals of the Upper St. Lawrence and Lake St. Francis. From Sault Ste. Marie, with the exception of a few miles on Georgian Bay, the route will be on landlocked waters continuously to Montreal. Grain will not only be *insured at minimum rates* on this route, but passing through the cool deep waters of the Ottawa in so much shorter time will *reach market in better condition* than if shipped by the Erie.

Its military importance.

The St. Lawrence route lies for a great part of its course on the boundary line of a foreign country, and should difficulties with the United States arise would almost inevitably be at once rendered useless as a means of communication with the upper lakes. The remoteness of the Ottawa from the boundary rendering it comparatively safe from interference in case of international complications, it would be of great military importance to the Empire. When once enlarged to 18 or 20 feet in depth, a work which must inevitably be performed, many of the smaller vessels of the British navy, lightened of their guns, could proceed from Montreal by its means to Lake Huron, and thence easily, from French River as headquarters, control Lakes Erie, Huron, Michigan and Superior, *appearing before Chicago in little more than a hundred hours after leaving Montreal.* The enlargment or extension of any other route to the neglect of this would only the more surely place Canada at the mercy of the United States, but the opening of the Ottawa could not fail to give her a great advantage in the negotiation of future treaties as to international waterways. And it would prove not only a source of military strength in case of war, but would be an indirect protection by affording an additional incentive to the preservation of peace, so firmly would its great commercial importance to the Western States bind them, in the furtherance of their own interest, to such a policy as would ensure the freest possible passage to their products on the way to Eastern markets. Restrictions imposed on Canadian traffic passing through the Sault canal have led to the construction by the Dominion Government of a canal on the Canadian side of St. Mary's River. This canal, opened in 1895, cost $3,000,000, and has one lock 900 feet long 60 feet wide, and 20 feet 3 inches deep. Its completion when supplemented by the Ottawa River navigation will give Canada an independent course to the sea entirely through her own territory and the least subject to interference from without of any possible route.

General (afterwards Field Marshal the Right Honourable) Sir John Michel, at one time Commander in Chief of Her Majesty's Forces in Canada, several years ago in a public address at Ottawa said: "I believe that the ties which happily unite Great Britain and Canada will be closer drawn by the opening of this route. I believe that the commercial development which would be produced would be incalculable. I believe that America and Canada and consequently Great Britain would be so commercially allied by the opening of this route that the grand object of all true lovers of either of these countries

would be attained, namely the certain peaceful dispersion of every little cloud that might arise in the political horizon of North America." Speaking of the position of Montreal he further said: "You are placed in a position held by no other city that I know of in the world. You are placed on the only spot on a vast continent which can be made the receiving house of one-third a continent's exterior trade, and able to dispatch that third to Europe. But you are unsafely situated. The grand route to the sea by the Ottawa and French Rivers should as soon as possible be undertaken, giving you a backbone of military strength, and bringing to your doors the vast trade of the vaster west."

And the late Hon. Alex. Mackenzie, for some time Premier of Canada, expressed himself thus in an able address on Confederation: "I am convinced that the true route for a canal to the Georgian Bay is up the Ottawa, because that would be giving a great backbone to the country. If we had a fine canal capable of carrying vessels of war in that direction, it would be a splendid means of defence, as well as a great highway for the commercial products of the West."

Public opinion in Canada.

There is and long has been an active public opinion in the Ottawa valley and elsewhere in Canada in favor of this work and no dissentient voice as to its feasibility and desirability. The Right Honourable Sir John Macdonald, G.C.B., late Premier of the Dominion, and the most eminent of Canada's statesmen, classed the opening of this route as equal in importance with the building of the Canadian Pacific Railway. "The Ottawa Ship Canal and the Pacific Railway must be constructed and no voice would be raised against the great national work which would open the Western States and Colonies to the seaboard," were his words on one occasion.

Hon. Alex. Mackenzie at another time said: "I am perfectly satisfied that the Ottawa valley presents the greatest facilities of any route upon the continent for the transportation of the products of the Northwest to the Atlantic Ocean."

Mr. Walter Shanly, the prominent Canadian engineer, after a glowing eulogy of the physical advantages of the route, says: "To those who have made the laws that govern the movements of western traffic their study I leave it to estimate the height to which Canada would be elevated in commercial importance by opening through the heart of her dominion a continuous navigation, shortening by fully one hundred and fifty miles, the shortest water communication that now does or ever can exist besides between tide-water, whether in the Gulf of St. Lawrence or in the estuary of the Hudson, and the broadest extent of grain growing country in the world."

Hon. Joseph Alderic Ouimet, present Minister of Public Works of Canada, says: "I am a believer myself in the feasibility of the scheme and its financial success."

Sir William Van Horne, of the Canadian Pacific Railway Company, has expressed himself as being favorable to the construction of the canals, insisting that this is the natural route between the upper lakes and the lower St. Lawrence, and that it should be opened at the earliest date possible. And believes that the country would be greatly benefitted by it, and that it would be of great assistance, and certainly no injury to his Company.

Its importance as a factor in the development of the Canadian Northwest can hardly be overestimated. Mr. B. E. Walker, General Manager of the Canadian Bank of Commerce, recognizes this fact, as well as the financial importance of the question of opening the route, in the Bank's annual report for last year. Referring to the wheat trade he says: "Doubtless as with most of the world's products, the question is one of transportation. The great question which is agitating many people in Canada and the United States is the possibility of

a better water transit. Can we not improve upon the Erie canal as a means of getting to the sea-board? Are we to see the foreign-bound traffic of the upper lakes deported at Buffalo, or are we to try and secure that traffic, and what is more important provide the necessary cheaper transportation to our Northwest Provinces?"

Mr. A. M. Wellington, Hydraulic Engineer, and one of the editors of the Engineering News of New York, giving an opinion as to the feasibility of the undertaking, says: "My conviction that the Ottawa River affords the best opportunity *on the globe* for a well-planned ship canal is a fixed one."

Feasibility of the project.

The practicability of the completion of a system of inland navigation on this route upon such a scale as contemplated has been placed beyond a doubt by surveys already made. The principal points to be taken into account on this score are:—

1.—The physical characteristics of the several streams passed through;

2.—The nature of the summit ridge to be crossed and the water supply at summit level;

3.—The terminal harbor facilities for lake and ocean vessels.

1. The Ottawa river resembles the Rhine in length of course, and the Danube in magnitude, its most prominent characteristic being its great volume even in its upper reaches while it has yet to receive tributaries equal to the Hudson, the Shannon, the Thames, the Tweed, the Spey, and the Clyde. Consisting as it does of long stretches of deep and still water interrupted by rapids and falls, it will lend itself readily to the formation of one of the most perfect systems of inland navigation on the globe. The rapids and falls are so located as to admit of being overcome in most instances by mere locks and dams, and between them will lie slack water navigation equal generally to that of the lakes themselves. Mr. Clarke says: "To improve the navigation of such a river system is a comparatively simple matter, for the greater part is already done to our hand, and we have only to devise some means of getting from one lake to another, and our task is accomplished." Thus in the 300 miles of the Ottawa River portion of the route, the following lakes are encountered: Lake St. Louis, 13 miles in length; Lake of the Two Mountains, 25 miles; Deschenes Lake, 27 miles; Chats Lake, 19 miles; Coulonge Lake, 20 miles. For the most part these lakes have a channel depth of from 20 to 30 feet at low water, few spots having as little as 14 feet. Deep River, a portion of the upper Ottawa 30 miles in length, is from 1000 to 2000 feet wide and of great depth, said to be over 100 fathoms in some places, and capable throughout the entire distance of floating the largest ocean vessels. The Mattawa and French Rivers are of the same general character as the Ottawa, consisting of long deep lakelike basins separated by short shoals. Of the 42 miles of the Mattawa, which is the broadest and deepest of the western tributaries of the Ottawa, about 24 miles have more than 30 foot soundings, and only about five miles of the entire course have naturally less than a ten foot channel. Of the French River Mr. Shanly says: "It might more properly be described as a succession of lakes than as a continuous river. The ascent is made in a series of level terraces, the rapids or falls between which are short, assuming in nearly every instance the cascade form. The depth of water between rapids is generally very great. I took soundings throughout with my own hand, and rarely lighted upon any spot where less than 12 feet of water was to be had, three times that depth being probably more common."

Speaking generally of the system, Mr. Shanly says that fully one-fourth of what he classes in his report as the river navigation of the Ottawa route might justly be put down as lake "having width and depth sufficient to admit half a dozen vessels as big as the Great Eastern running side by side."

Mr. G. Blake Walker, F. G. S., Vice-President of the Midland Institute of Engineers, in a paper read before that Society, speaking of the Nicaragua canal undertaking, said: "The scheme which I will now describe to you is *a great improvement on any previous system* of canal making, and certainly far in advance of anything suggested hitherto. It consists of a system of making canals without excavation by utilizing the natural boundaries of the river valleys, and by raising the level of the water. Any width and depth of water can be obtained; it is the question simply of damming up the valleys. In the case of the Nicaraguan scheme the *physical features of the country lend themselves in a remarkable way to the achievement of this design.*"

As has been pointed out, Nature herself has already done the greater part towards providing such a system of navigation on the Ottawa route; and to much of the remaining distance, the concluding words of the quotation are markedly and particularly applicable. Mr. Clarke, the engineer, says, "On the greater part of the river where the water is required to be raised, the shores are bold, and the desired lift would overflow but little land. Here we have only to raise the natural dams or reefs of rocks to the desired height by artificial structures thus restoring a condition which possibly existed before the ceaseless rush of the waters or glacial action had worn the rock dams down to their present state." "Fortunately, every existing condition favors this mode of construction. The bed of the river consists of hard crystalline rocks, worn smooth and generally free from boulders; and the shores of the same material rise abruptly on either side, diminishing the length of dam required."

And Mr. H. K. Wicksteed, C. E., says: "The greater portion of the route is admirably adapted for a waterway, having rocky walls which approach one another very closely at points, and affording magnificent opportunities for the creation of reaches of slack water by means of dams across the valleys of streams."

The volume of water is not only ample (so that at the time of lowest water the dams would always be submerged with from one to two feet of water running over their crests) but, owing to the extensive system of reservoirs afforded by the numerous lakes, the flow is extremely uniform. The average rise of the Ottawa where free from obstructions is about 12 feet; and a very important effect of the construction of a system of dams would be to diminish this variation between high and low water. Nor is the river subject to sudden rise or extraordinary floods. Mr. Clarke says on this point: "Its common rise is one inch per day, and it never averages over three inches in 24 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."

2. The summit level is obtained by bringing to the same height Lac Talon, Trout Lake, and Lake Nipissing, the latter a fine sheet of water 60 miles in length, from 15 to 30 in breadth, and fed by three rivers. Thus the water supply at the summit will be practically inexhaustible, or as expressed by the engineer, "sufficient for any scale of navigation and for all time to come." The plan proposed gives a summit level for navigation of 57½ miles in length with a reception basin 80 miles long and varying from half-a-mile to twelve miles in width making a surface of about 330 square miles. On the crossing of the height of land between the two last named lakes followed by Clarke and Shanly, an elevation of 23 feet above the surface of Trout Lake was encountered. Later explorations by members of the staff of the Geological Survey have disclosed a practicable crossing where the *summit ridge nowhere rises more than four feet above Trout Lake*, a fact brought out in a paper read in May of this year before the Royal Society of Canada by Dr. R. W. Ells, LL.D., M.A., Geologist of the survey, embodying results of his personal examinations of the route and those of Mr. A. E. Barlow, M.A., Assistant Geologist. The distance between

the two lakes at the point in question is about three miles, and the exit upon Lake Nipissing is convenient to the town of North Bay on the Canadian Pacific Railway. The cutting on the summit ridge is said to be largely through earth and sand, much of the space being occupied by an open marsh easily drained.

3. A safe, commodious, and well-sheltered harbor at the mouth of French River will afford ideal terminal facilities on Georgian Bay. The hydrographic survey of Georgian Bay and the North Channel of Lake Huron made at a cost of $215,000 (£44,000) by Mr. W. J. Stewart under instructions of the Department of Marine and Fisheries was completed in 1894, and accurate charts of those parts of the lakes now exist. Mr. Shanly says of the bay at the mouth of the French River that it fulfils all the conditions of a noble harbor, being protected on the south and south-west by the Bustard group of islands, and on the north-west by a projecting headland of granite; while Dr. Ells states that the lights already in position sufficiently mark the channel to its entrance to make it perfectly safe for any vessels now navigating the lakes.

At the eastern end the outlet of the navigation would be either through Lake St. Louis and the Lachine canal, or preferably by Back River giving Montreal, like New York, a double water frontage and enormously increased harbor accommodation.

It is the unanimous opinion of the several engineers who have examined the route, that it presents no unusual engineering difficulties and that it is merely a question of so many cubic yards of rock excavation and earth dredging, and of the construction of a certain number of dams and embankments. On the lower portions of the Ottawa passing through a fertile farming country cultivated to the waters edge, the plan is to maintain existing levels as far as possible, and overcome changes of level by canalling; on the remainder of the route where the river walls are high and the valleys narrow, and the principle wealth of the country is in the mines and forests, to gain the depth required for navigation by raising the surface of the water rather than by expensive submarine rock excavation.

Estimated cost.

Surveys of the route were made as early as 1858-1860 under the directions of the Dominion Government, plans and maps of which are now in the Department of Public Works of Canada, and will be placed freely at the disposal of the Company. Two plans of improvement of the navigation were submitted, viz: those of Mr. Walter Shanly and Mr. T. C. Clarke. The latter resorted much more freely to improvement of the natural watercourse by dams in preference to construction of canals: thus producing long stretches of slack water connected by locks at the points of greatest descent. To this method the nature of the several rivers traversed, as already stated, is extremely favorable, the banks being generally high, and the amount of land flooded in any case small. Mr. Clarke's estimate called for 29 miles of canal between Georgian Bay and Montreal, at a cost, (excluding Lachine Canal, already constructed), of $12,058,680 or about £2,400,000. His report is to the effect that of the 430 miles total distance, 351.81 *miles are already a good natural navigation*, and require no improvement; and that it is perfectly practicable so to improve the remaining 78.95 miles as to convert the whole into a first-class navigation for steam vessels, and reduce the length of canalling required to 20.82 miles exclusive of the Lachine canal. Adopting a 12 foot channel as that best adapted to the route, his estimate at that time (1860) was that the cost of completion of the whole navigation on that scale would be less than £6,000 per mile.

Several points are to be noted as affecting this estimate:

1. Since it was made the St. Anne's and Grenville canals have been enlarged to nine feet in depth completing a channel of that depth as far as Ottawa City, a distance of 116 miles. About £1,500,000 have been spent to date on the improvement of the navigation of the lower reaches of the Ottawa,

River. While above the City of Ottawa £80,000 have been expended on the Culbute canal, the benefit of which the Company will receive.

2. At the time of the survey, for many miles of its course, the route traversed an unbroken wilderness, accessible in summer only by means of canoes and in winter on snowshoes. Now the Canadian Pacific and other railways run contiguous to it for 380 out of the 430 miles, and afford the greatest possible facilities for getting in all needed supplies. Owing to this fact also work can be prosecuted to advantage at numerous points at the same time, and thus pushed rapidly to completion.

3. Improvement in methods and means of excavation and canal construction since that time will lead to a great diminution of the cost for work of that nature. According to Mr. Clarke's estimate the total amount of excavation and dredging necessary to complete a 12 foot channel is a little over 4,000,000 cubic yards. His calculations were made on the basis that 2,370,190 cubic yards of rock excavation would be required at a total cost of $3940,875, being an average of $1 66 per cubic yard. Warner Miller, President of the Nicaragua Canal Company, in a recent article on the Nicaragua canal undertaking, says: "The cost of rock excavation has been reduced in actual practice in the great drainage canal now being constructed at Chicago to less than thirty cents per yard." Supposing the excavation on this route, from the hard nature of the rock met with, to cost twice that much, or sixty cents a yard, there would still be a saving effected over the original estimate of over $2 000,000 or £400,000, provided no additional excavation were found to be necessary.

Mr. R Adams Davy, C.E., in reporting on the project in November, 1894 from personal knowledge and examination of the route, and after carefully going over the several plans and surveys made by the other engineers mentioned estimates that the cost of construction for a canal of ten feet draft should not exceed $15,000,000 or £3,000,000; and that the time occupied in its construction need not exceed three years

While a channel of from nine to twelve feet depth has been considered sufficient for present needs, an important item in estimating the cost of the work is the prospective cost of enlargement to a ship channel of say 16 to 20 feet in depth when the traffic shall demand it. On this point Mr. H. K. Wicksteed, C.E., says: "The difference in cost between a route for 18 feet navigation and one for 9 feet navigation is not nearly as great as in ordinary cases. *If made for the latter probably 75 per cent. would be available for the former without further improvement.*"

As has been said of the proposed Forth & Clyde canal this project at its inception will have the advantage of the fact that an enormous traffic now exists ready to benefit and be benefitted. Here the "*business exists in a crowded condition awaiting new outlets*"

A route possessing such material advantages over all others in point of directness, shortness, saving of time effected, cheapness, and safety must be a strong competitor for through traffic from the day it is opened, and will at once absorb a large share of the eastbound trade. Thus it must become the great route for the grain traffic which has its source principally in Lake Michigan and Lake Superior ports, the latter alone sending out nearly 80,000,000 bushels a year of grain and grain products, an amount which will undoubtedly double within 10 years. The diversion of grain traffic to the Ottawa route must result in cheaper return rates for freight from Montreal owing to the number of vessels that would seek westbound cargo at that point, while the operation of the same cause must lower ocean rates to and from Montreal, since grain would be shipped from that port in large quantities that now finds its way to New York by rail

and the Erie canal. British and Canadian interests would be best served by the Ottawa route which is preferable to all others in that they one and all side-track Montreal for the benefit of New York, while it directly tends to increase the importance of Montreal as a distributing point for the northern part of the continent.

Mr. R. Adams Davy says: "The amount of freight passing Detroit annually is over 20,000,000 tons, and is rapidly increasing, so that at the end of five years from now it will probably exceed 30,000,000 tons. If only 1-10 of this can be diverted, which it is quite reasonable to expect, a toll of fifty cents a ton on 3,000,000 tons will give a revenue of $1,500,000 from this source alone, which is ample to provide for the interest and running expenses."

Mr. H. K. Wicksteed says: "Making every allowance, I cannot estimate less than 9 or 10 million tons, which would be immediately diverted over the shorter route were the canal to be opened to-morrow."

Adopting the more conservative of these estimates, it may fairly be calculated that the total traffic from all sources at the outset will be 5,000,000 tons annually. With a toll rate of 50 cents per ton, there would be from this source of revenue alone an income of $2,500,000, or sufficient to pay, (supposing the total cost not to exceed $25,000,000):

Interest at 4 per cent. on $25,000,000	$1,000,000
Maintenance and operation	500,000
Sinking fund	500,000
Dividends	500,000

Sources of revenue.

Nor is the diversion of an existing traffic of such immense and rapidly increasing proportions the only prospective source of trade along the route, for its opening will develop resources of inestimable richness. Bouchette writing in 1832 estimated that the Ottawa valley is capable of supporting 8,000,000 people; its present population is about 400,000. In salubrity of climate, fertility of its well-watered valleys, transparent purity of its trout-filled lakes and brooks, wealth of mines and forests, and variety and value of resources no like tract of country in Canada can surpass it. Thus, vessels carrying grain eastward would find return cargoes of lumber for lake ports. Chicago is the great centre of distribution for lumber on the continent. As long ago as 1883 according to a speech delivered by Mr. Joseph Tasse in the Canadian House of Commons its receipts by lake and rail were 1,909,910,000 feet, of which more than 1,065,000,000 were re-shipped, railroads receiving $4,000,000 and shipowners $3,000,000 for transportation. The route *passes through the heart of one of the richest lumber districts of the continent.* Michigan and Wisconsin pine woods are being rapidly exhausted and a large traffic in lumber must be developed along this route from the heavily timbered districts of northern Ontario and Quebec to Chicago and other lake ports for distribution to the great prairie States of the West.

The country passed through possesses not only vast stores of pine, but also maple, spruce, hemlock, poplar, balsam, white cedar, tamarac, birch, beech oak, elm, ash, basswood, and other woods of commercial value and used in rapidly increasing quantities in the manufacture of furniture, finishing of houses, making of pulp, etc. The growth of the last-named industry has been very rapid, and low freight rates would create new facilities for its successful carrying on. Thus the exports from Canada of wood pulp have increased from nil in 1889 to $386,092 in 1893 and those of wood for pulp from nil to $455,893 during the same period.

Millions of acres of fertile lands in Northern Ontario now covered with timber will with the advent of cheap transportation fill up with settlers: and

in Algoma, Temiscamingue and Nipissing Districts many thousands of people will make homes. Mining and smelting operations, the requirements of manufacturing, and of the population will give rise to an ever increasing demand for coal; and an important feature of the traffic in the near future will be the carriage of coal from Lake Erie ports to points on the system, and to French River as a coaling station for vessels engaged in the grain trade, with return traffic of lumber and ores from the rich timber and mineral regions along the route. Mining is yet in its infancy in the Ottawa country, but researches made up to the present time have shewn it to be possessed of incalculable stores of mineral wealth. Within a few miles of the city of Ottawa are immense quantities of iron ore of great richness. The nickel and copper deposits of the Sudbury region are already famous; and at many points the Huronian formation which extends for long distances has been found to abound in minerals. Gold, silver-bearing galena, zinc, platinum, tin, molybdenum, graphite, apatite, mica and iron are found, and to some extent already mined. Fine granites, sandstones, roofing-slates, serpentine and dolomitic marbles, etc., are among the non-metallic mineral resources of commercial importance awaiting development; and the carriage of ores, building-stones, marbles, granites, etc., must in a short time afford the source of considerable revenue to the canals.

The four items already mentioned, viz.: grain, lumber, coal and ores contain almost 90 per cent. of the traffic of the great lakes, and the bulk of the traffic of the Ottawa route will no doubt be derived from the same sources.

Hydraulic power.

According to the Ottawa survey, the drainage area of the Ottawa River is 80,000 square miles; its length 700 miles; volume at Grenville 35 miles from its mouth—discharge in cubic feet per second at low water 35,000—at high water, 150,000—mean flow, 85,000; or nearly three times that of the Rhine and roughly seventeen times that of the Thames. Between Deschenes Lake and Ottawa, a distance of 6·36 miles, are rapids with a descent of 60 feet, 36 of which are taken up by the Chaudiere Falls, a magnificent fall which affords one of the finest waterpowers on the continent. At Des Joachims the fall is 26·4 feet in 1·64 miles. At Rocher Capitaine the fall is 40·9 in 1·35 miles. Between the head of Chats Lake and the head of Calumet Island there is a fall of 102·48 feet, more than half of which on the north channel is concentrated at Grand Calumet Falls. The total lockage on the Ottawa being 440 feet, there remains 200 feet descent available at various points on the river other than those mentioned. The possibilities of the Ottawa route in the production of hydraulic power have been stated by Mr. Shanly as follows: "Its water power is not only unlimited in capacity, but available to its full extent at numberless stages along the route. By the opening of the projected navigation this great manufacturing agent would be brought into comparative proximity to the granaries of Lake Michigan, and would immediately be turned to account in preparing the cereals of the West for the markets of the East. With such a combination of advantages in possession or prospect it is surely not difficult of belief that *the valley of the Ottawa is destined to be not only the workshop of Canada, but one of the chief manufacturing districts of America*."

A most significant feature of the export trade in breadstuffs from this continent is the rapid increase in shipments of flour, a fact clearly pointing to the possibility of the establishment of a milling industry of gigantic proportions on the Ottawa River when its vast water power shall be rendered available, and at the same time given the best possible shipping facilities by the opening of the shortest of all routes to the sea.

Electric power.

Mr. O. Higman, Member of the Institute of Electrical Engineers and Associate Member of the Canadian Society of Civil Engineers, says with regard to the development of electrical energy from the various water powers along the route:

"It would be difficult to find, on this continent at any rate, a similar succession of waterfalls along a like distance, and through a country so well favored for manufacturing purposes. With the methods of long distribution of the electric current that are now being perfected by Tesla and others, there is no reason why sufficient energy should not be generated along the Ottawa and its tributaries, not only for local purposes along the route, but for the operation of the Canadian Pacific and Canada Atlantic and Parry Sound Railways between Georgian Bay and Montreal."

At the present time when the application of electric energy to the processes of manufacturing and to transportation, heating, lighting &c., is making rapid strides every day, it would be rash to attempt to treat in any other than the most general way the subject of the value of the enormous water power on the Ottawa River and its tributaries for the generation of this force. There seems little reason to doubt that wherever water power is readily available it will in the near future be turned to account in this way, superseding steam in most of its ordinary employment as a motive force. In the hydraulic powers along its route therefore, there is every reason to believe that the Company will be possessed of a resource of inestimable value.

Connections.

The Ottawa River navigation system has its outlet at the port of Montreal, the head of Atlantic Ocean navigation, there being a channel of twenty-seven feet and six inches in depth from that point eastward on the St. Lawrence. At Montreal it reaches

1. An ocean port over three hundred miles nearer to Liverpool than New York is;

2. The Grand Trunk, Canadian Pacific, Central Vermont, and connecting systems of railway to New York, Boston, Portland and Halifax, and all intermediate points in New England, Quebec, and the Maritime Provinces;

3. An existing waterway to New York via the St. Lawrence and Richelieu Rivers, Lake Champlain and the Hudson River, the highway for the lumber traffic from the Ottawa district to New York.

The construction of thirty-two miles of canal from a point on Lake St Louis to the level of Lake Champlain at St. Johns on the Richelieu River, and the enlargement of the Champlain canal from the south end of Lake Champlain to the Hudson River, in connection with the completed Ottawa route would afford a waterway between Chicago and New York seventy miles shorter than the Erie and with 230 miles less of canal, 100 miles less than the route via the Welland canal and the Erie from Oswego and with 110 miles less of canal, and 250 miles shorter than the St. Lawrence and with 45 miles less of canal. The respective distances between Chicago and New York by such routes being as follows:—

	Canal.	Lake & River.	Total.
1.—via Ottawa and French Rivers and Lake Champlain	120	1228	1348 miles.
2.—via Erie Canal and Hudson River	350	1065	1415 "
3.—via Welland Canal & Erie from Oswego	230	1215	1445 "
4.—via St. Lawrence Route	163	1441	1604 "

By the completion of such waterway in connection with the Ottawa route the distance from Chicago to New England ports on the east side of Lake Champlain would be lessened to 1000 or 1100 miles with only 53 miles of canalling as compared with a distance of 1300 to 1400 miles by the Erie with no less than 420 miles of canal.

The City of Ottawa, 116 miles from Montreal, is already a railway centre of some importance. The Canada Atlantic, the Prescott and Brockville branches of the Canadian Pacific, as well as its main transcontinental line, the Arnprior

and Parry Sound Railway, the Pontiac and Pacific Junction Railway, and the Gatineau Valley Railway already have entrance to the city.

The River Du Lievre, a tributary on the north side of the Ottawa, a few miles farther down is navigated by small vessels plying from Buckingham on the Canadian Pacific to the apatite and mica mines of the region. At Ottawa, the Gatineau, a fine stream of 400 miles in length enters from the north, and the Rideau from the south. The Rideau Canal, 125 miles in length, between Ottawa city and Kingston, at the foot of Lake Ontario, was built as an Imperial military undertaking about 1830, and in connection with the lower Ottawa, formed the only highway to Lake Ontario until the construction of the St. Lawrence canals impaired its usefulness. With a large grain traffic on the Ottawa, something of its old importance would perhaps be restored by increase of coal freightage from Oswego to Ottawa as a coaling station for the grain fleet.

The Kingston and Pembroke Railway runs from the foot of Lake Ontario to a point on the Ottawa a hundred miles farther up.

A branch of the Grand Trunk Railway extends northward from Toronto to North Bay on Lake Nipissing; and a railway is projected to run from North Bay or Mattawa to James Bay through the Temiscamingue country.

From French River there is, of course, ready access to all the railroads which touch the upper lakes and very great facilities are afforded, both of collecting freights from all the country bordering upon them and of distributing over a wide area the products of the Ottawa country.

Should the proposed junction of the Mississippi River system of navigation with that of the Great Lakes be effected, it would lead to an immense augmentation of traffic in which the Ottawa route would share.

The importance of the tributary system of the Ottawa will be seen from the following list of its principal feeders, many of which have valuable water-powers along their courses, and pass through rich mineral, timber or agricultural lands:—

Entering from the south are the

	Course in miles.	Area of basin.	
South Nation River.....	100	——	Sq. miles.
Rideau "	116	1350	"
Mississippi "	101	1120	"
Madawaska "	210	4100	"
Bonnechere "	100	980	"
Petewawa "	140	2200	"

And the Mattawa River described as "the broadest and deepest of the western tributaries of the Ottawa; while from the north come the

	Course in miles.	Area of basin.	
Assomption River.....	130	——	Sq. miles.
Rouge "	90	——	"
North Nation "	95	——	"
Du Lievre "	260	4100	"
Gatineau "	420	11000	"
Coulonge "	100	100	"
Black "	130	1120	"
Indian "	——	——	"
Desmoines "	——	——	"
Montreal "	120	——	"

and the Keepawa, "a river exceeding in volume the largest rivers of Great Britain.