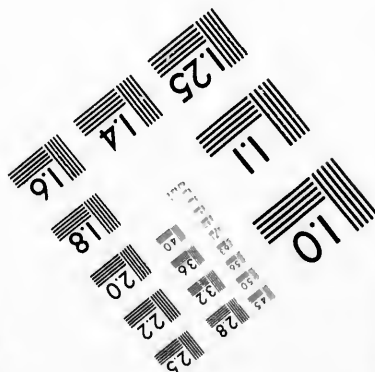
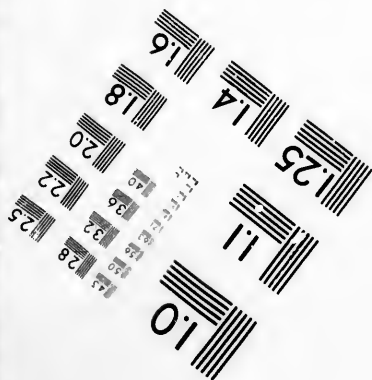
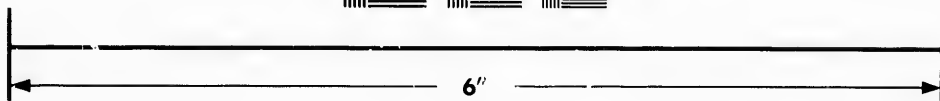
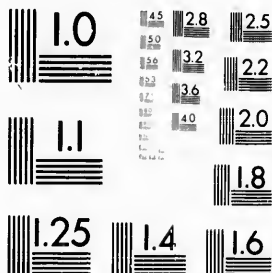


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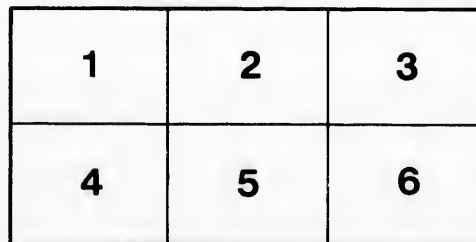
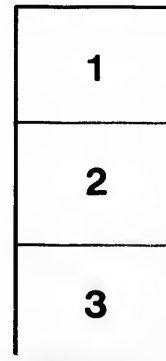
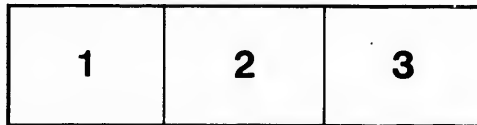
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PUBLIC OPINION

ON THE

CHIGNECTO SHIP RAILWAY,

AND THE

Baie Verte Canal.

1887.



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1887.

INTRODUCTION.

This Pamphlet comprises a consensus of opinions on the commercial value of an Isthmian Transit between the waters of the Gulf of St. Lawrence and the Bay of Fundy, for the conveyance (without transshipment) of bulky articles of commerce, which cannot with convenience and economy be carried any great distance by the ordinary railway, such as lumber, coal, gypsum (plaster), building stone, potatoes, deals, fish, etc., etc., etc.

The statistics of existing trade, given in these pages, shew the importance of a short cut by steamers and sailing craft between Prince Edward Island and St. John and all ports in the Gulf and Bay now separated by the Isthmus of Chignecto.

The Pamphlet also contains an Estimate of the Traffic, that will follow the construction of the Ship Railway, supported by independent testimony of the most convincing character. It describes its suitability for the purpose of carrying this traffic in preference to a Canal, which was not designed for the transport of the modern steamers of the Gulf. It gives in evidence of its practicability, safety, and economy the opinions of eminent engineers and naval architects, who have specially examined its merits, and of its commercial advantages, the opinions of public men whose character is unimpeachable, and whose experience carries weight.

All that has been said in favor of the Baie Verte Canal years ago, notably in the verdict of the Canal Commission of 1871, applies with greater force at the present moment, because of the great increase of trade and productions since that year, which warrants the belief that the next decade will witness a still greater increase in their wealth if additional facilities of communication be provided.

Sackville, N. B., June 10, 1887.

H. G. C. KETCHUM,
M. Inst. C. E.

Chignecto Ship Railway and the Bale Verte Canal.

Opinion of the Press, Public Men, and Authorities as to Commercial Value.

"All the traffic of the Gulf and River St. Lawrence which tends southwards stands in urgent need of the completion of this work."

"It is obvious that if the Ship Railway is once built and made a practical highway for ships it will at once receive a large traffic.—*St. John Telegraph*.

"Mr. Francis Hall, C. E., the Engineer sent out from England in 1825 to survey the Isthmus for a Canal, estimated the traffic in that year at 20 vessels per diem."—*Haliburton's History of Nova Scotia*.

"It is unnecessary for me to dwell on the importance of an undertaking which seems to be generally admitted."—*Capt. Crawley, Royal Engineer, 1883*.

"The use of steamboats being generally introduced in America, if this Canal were completed, ready access would thereby be opened, not only with Quebec and Montreal but also with the upper lakes to a boundless extent."—*Sir Thomas Telford's Reports, 1885*.

"There is no public work now presented to the Dominion which will be so far-reaching in its beneficial consequences, not only to Canada but the whole of the Atlantic Coast of North America."—*Evidence of Hon. John Boyd, Senator of Canada to Canal Commission in 1871*.

"Any one who knows the character of the upper waters of the Bay of Fundy will understand that no Canal could ever be kept free from the sediment deposited by them except at an expense ruinous to the financial success of the work."—*Fredericton Capital*.

"We believe that either a Ship Canal or a Ship Railway across the Chignecto Isthmus will shortly become a pressing need that must be supplied."—*Evening News, St. John*.

"Few, if any, proposed public works will have greater beneficial consequences to the Dominion than this."—*Traveller, Boston, U. S. A.*

"Nature seems to have left but little for man to do in order to open up a highway for the ships of nations to pass between the Gulf of St. Lawrence—the Mediterranean of British North America—and that part of the Atlantic Ocean into which the Bay of Fundy discharges its waters."—*Alex. Monroe, C. E., 1866*.

"This great engineering project makes a short cut for navigation between the United States and the ports on the St. Lawrence Gulf and River, and saving the long and dangerous voyage around Nova Scotia."—*Scientific American, New York*.

"Referred to the industries which would be benefited by Ship Railway instancing the produce of Prince Edward Island, now often received by long voyages, also coal, grindstone and building stone."—*Hon. Hiram Black's Speech*.

"The number of vessels engaged in Canadian fisheries was 1,150; the average tonnage, 46,856; the average number of boats, 26,106; and the average number of men, 60,589—from returns 1879-1880 and 1880-1881."—*Sir Leonard Tilley's Speech in House of Commons*.

"It has been shown that there is a tonnage on the Bay of Fundy and Gulf ports of something like 2,687,550 tons, entering and leaving those ports, which would re-

ceive the advantage of this work. Then there is the (American) fishing fleet of not less than 600 vessels, and who can estimate the value to the country at large of having the means of crossing from the Gulf of St. Lawrence to the Bay of Fundy by means of this Ship Railway, enabling vessels to carry two cargoes and make two voyages from Boston to the Gulf for every one by the existing mode of navigation. It would not only afford access to the large American fleet of fishing vessels that would be passing across the Isthmus to the fishing grounds, but our own fishermen would be able, by obtaining access to the American ports, to carry on their business with a vigor and success which are impossible at present. It is estimated that there would be a traffic of 600,000 tons."—*Sir Charles Tupper's Speech in House of Commons.*

"I regard the tide in the Bay of Fundy of the greatest possible advantage, because it does not leave a vessel dependent on the wind to the same extent as elsewhere. The vessels go up with one tide and down another."—*Sir Charles Tupper's Speech.*

"I think this undertaking will be of very great benefit, to the Maritime Provinces especially. It will give them very easy access to the United States *via* the Bay of Fundy, and more especially will that be the case in respect to the people of Prince Edward Island and the northern portion of Nova Scotia and New Brunswick. Consequently cargoes of potatoes being a perishable article now suffer very materially."—*Mr. McDonald, M. P.*

"When you look at the volume of trade that will seek this route it cannot but prove entirely successful."—*Sir Charles Tupper's Speech at Amherst, N. S.*

"A very slight knowledge of the volume and direction of marine traffic between the Gulf and Bay of Fundy and the Atlantic, and a glance at the map would convince any person of the desirability of some means of transporting vessels and their cargoes across the Isthmus of Chignecto."—*Daily Transcript, Moncton.*

"Engineers of the highest authority have given their assurance that the Ship Railway possesses in all essentials striking advantages over a Canal—advantages in points of *expeditious transit, permanency of way, cost of operation, length of season to be used, and capacity for commerce.*"—*Chignecto Post*

"As to the traffic which is anticipated for the Ship Railway, evidence accumulates in favor of the scheme."—*Daily Sun, St. John.*

"There is not the least doubt that the Ship Railway will share the same unforeseen success that has characterised all leading lines of traffic on this continent."—*Amherst Gazette.*

"From St. Andrews to Quebec inclusive, the ports of the Bay and Gulf collectively are visited by seven and a half millions of tonnage. The trade is divided into two parts by the now impassable Isthmus of Chignecto. The Engineers' estimate is that only 600,000 tons of traffic would make the work a paying investment. That would be but 3,000 tons a day for 200 days of traffic. This appears a very moderate estimate, and it is, in fact, but 8 per cent. of the shipping trade of the ports along the route from St. Andrews to Quebec. Indeed, looking to the future and remembering the great progress America is making, it is easy to see that the project promises to become one, not only of very great advantage to commerce but a handsomely paying property for the enterprising company."—*Telegraph.*

"It was in the interest of the merchants to have the Railway constructed as soon as possible, as a large trade would be opened up between ports in the North Shore and St. John. The quarries and mines at the head of the Bay of Fundy, in which the merchants of St. John were largely interested, would be materially benefited."—*W. H. Thorne, Esq., Board of Trade Meeting, St. John.*

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"Coal steamers on time charter, running from Pictou to ports in the United States (where rapidity of movement is all important,) would unquestionably use the Isthmus route."—*F. W. Henshaw, Esq., President Montreal Board of Trade.*

"If the Railway works as well as the plans indicate and engineers believe, it will revolutionize the commerce of the Maritime Provinces."—*Daily Sun.*

"The great development of shipping, fishing, and general trade, in the sixty years since Mr. Hall's estimate was made, leads to the conclusion that Mr. Ketchum's estimate of the traffic for the Ship Railway (600,000 tons) is not overstated. For each particular of these probable items of traffic, the name of some prominent public man is given as an authority, so that the estimate is not that of one, but of many well informed persons."—*Daily Telegraph.*

"In the event of the Ship Railway being consummated, Lake vessels bringing down Western produce could carry back to Chicago cargoes of best brown stone. Fifty thousand tons yearly would not be an extravagant estimate in the immediate future for this trade alone. The owners of stone could afford to pay a handsome toll—a dollar a ton—for the transport across the Isthmus."—*Joseph B. Read, Manager of Stone Quarries, letter to Sun.*

"The flow of traffic that will pass over this Railway can be imagined by a glance at the map. It will lower our freights to and from our natural markets, and in this way must save money directly to our people, both as consumers and producers."—*Summerside Journal, P. E. Island.*

"This Railway will be of great use to those trading between the North Shore of New Brunswick and the United States, as it gives them a short cut to the seaports of the Republic. Prince Edward Island will be benefited in a similar manner, but in a less degree. Advantages from this connection by rail of the waters separated by the Isthmus of Chignecto would, no doubt, arise, which have not been foreseen. This is always the result of increased facilities of communication. They create a trade for themselves."—*Montreal Herald, Sept. 10th, 1885.*

"The Railway will afford complete water communication between Quebec and St. John, either of which cities is said to have one hundred fold the shipping trade with transatlantic cities that the two cities named have with each other."—*Free Press, Ottawa.*

"The Gulf trade with New England, with the West Indies, and with South America, would at once receive a great impetus on the completion of this work."—*St. John paper.*

"The line being virtually level and straight, the length but 17 miles, and the speed slow, it is evident the working expenses should be less than on an ordinary Railway. In fact, if the line is as solidly constructed as contemplated, the working expenses should be but little more than the cost of 'locomotive power' added to the expense of lifting and lowering the vessels, a process which is daily economically carried out in the Victoria Docks, on the Thames, and elsewhere."—*Sir James Brunlees' letter, 13th January, 1883.*

"In my opinion, a vessel would occupy 14 days in sailing from Charlottetown, Shediac, or Baie Verte to St. John, N. B., and by Ship Railway, from any of the above ports to St. John, about one or two days."—*Capt R. C. Haws, Liverpool. Letter, 1st July, 1886.*

"There is no fear whatever of a ship undergoing any strain in the process of lifting out of the water (as would be necessary in case of a Ship Railway) that she is not liable to at present in ordinary decking."—*Sir E. J. Reed, M. P., evidence on Mexican Ship Railway.*

"Shipmasters, engaged in the European trade, assert that when in a voyage from St. John, N. B., to Europe, they pass the Gut of Canso, they consider they have accomplished half their voyage. By using the Ship^m Railway all vessels, not exceeding 1,000 tons register, could pass through the Gut of Canso, from St. John, in from two to four days, thus saving, on an average, from 10 to 15 days."—*Letter to Post*.

"There is no form of structure which is known to be subject to more unequal-irregular and ever-varying strains than a ship at sea, and these very points are carefully guarded against in her designs and construction. * * * If there was any fear of a cargo bursting her sides—as some have held there is—it would have burst them on her first loading, as although water is incompressible in confinement, it is exceedingly yielding when unconfined. Hence the risk of damage to vessels by straining during transport over land may, at once, be set aside as puerile."—*Iron, London, October 3rd, 1884*.

"There will, in my judgment, be little or no difficulty in transporting properly constructed ships from sea to sea with entire convenience and safety."—*G. Fosberry Lyster, C. E., Liverpool Docks*.

"If the 900-ton propeller could deliver Western or Canadian products at Halifax or St. John, these places would thus become cheap depots for such products. Assorted cargoes of fish, hoops, shooks, lumber, etc., could be made up at these ports for the West India Islands and South America, and could bring back return cargoes, from these countries, of sugar, coffee, hides, tallows, etc., to be again re-shipped as return cargo to Canada and the Western States by the inland propeller, and thus delivered at less cost by such means than by any other possible route."—*Hon. John Young's Speech, Dominion Board of Trade, 1871*.

"Hundreds of American vessels would pass and repass through this Canal, and they could afford to pay toll, because it would enable them to make an additional voyage each season."—*Hon. R. B. Dickey, Senator*.

"An object of vast importance is the opening of a safe and easy passage to Quebec several weeks earlier in the spring than can be reckoned upon by the present route and wholly avoiding the great danger of encountering the ice between Newfoundland and Cape Breton or in the Gut of Canso."—*L. Donaldson, Chamber of Commerce, St. John*.

"The practice of lifting a ship of large size, clean out of the water, has become an every day occurrence."—*Mr. William John, Shipbuilder*.

"Now this project, which has been very much talked about, was entered upon as a substitute for the well-known Baie Verte Canal. That was an undertaking which was agitated in the Provinces of New Brunswick, Nova Scotia and Prince Edward Island for half a century. It received the sanction of every governor and every military commander to whom it was referred during the whole of that period, and it became one of those things that had to be done."—*Senator Dickey*

"There are other points, besides those in New Brunswick and Prince Edward Island, and there are vessels trading weighing up to 2,000 tons, and some of these are at this moment, or were a few days ago, and had been for many days previously, prevented from getting through the Straits of Canso by the ice. Sometimes vessels are obliged to lie there for weeks—vessels of 3,000 tons—waiting for a chance to get through. With this avenue open between the Gulf of St. Lawrence and the Bay of Fundy they would not be blocked in that way. The Straits of Northumberland are sometimes blocked with ice when Charlottetown and other ports are free from it, and communication is practicable between them and ports in Nova Scotia and New Brunswick."—*Hon. Mr. Carvell, Senator*.

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"I was not surprised at all to find opposition coming from the members who represent Halifax in this House. From the first inception of the project of a Canal through the Isthmus we met with the opposition of the merchants of Halifax, and it was obvious why that opposition came from them. They were well aware that the large commerce of the Gulf of St. Lawrence would pass down the Bay of Fundy and go to United States ports instead of going by way of Halifax; and they knew that it would not be an advantage to their city. But Halifax is not all the Maritime Provinces; nor should the pecuniary interests of the merchants of Halifax prevent construction of a work which will be of great advantage to all the rest of the Dominion. It is impossible to say what the traffic may be, provided the work is a success. It is admitted, and all the ablest engineers that have been consulted state decidedly, that there is no difficulty in constructing this Marine Railway."—*Hon. Mr. Botsford, Senator.*

"We want direct communication with Prince Edward Island, and I think Prince Edward Island wants it with us. Is it reasonable that Halifax should stand in the way of the produce of Prince Edward Island coming round to St. John if a better price is offered there for it? I think it is only reasonable that we who wish to have a short route to St. John should get it and have the advantage of competition. It is no argument that there is now no traffic between the Bay of Fundy and the Gulf of St. Lawrence. Open the way for the traffic, and we do not know to what extent it will develop. We have to look merely at the trade of the Bay of Fundy; but if the whole of Western Canada find that trade with the West Indies can be carried on safer and on better terms by this route than by sailing round the dangerous coast of Nova Scotia, it is impossible to say to what extent that trade will develop in consequence of the construction of this road."—*Hon. Mr. Wark.*

The following is extracted from the "Report of the Canal Commissioners" of 1871. Sir Hugh Allen, chairman:

"The growth of Intercolonial trade depends on *cheap transit*, since the merchandise passing between the Maritime Provinces and Ontario must be of a bulky character, requiring large vessels and rapid despatch to be really profitable. When a propeller can go direct with a cargo of coal, or other produce of the Eastern Provinces, to Kingston and Toronto, and there get a return freight of flour, barley and other West ern produce, Intercolonial Trade will have entered on a new era.

When Nova Scotia coal of the best description can be supplied abundantly and cheaply to Western ports, a great impulse will necessarily be given to the transfer of the trade of the St. Lawrence and Lakes to screw steamers, a transfer already taking place, as we have previously shown. With the Canals enlarged coal freights would be reduced to the minimum point—a lake propeller would always bring back from the lower ports a cargo of coal, rather than come empty—just as the English timber ships have been accustomed to bring the same article instead of ballast.

Inseparably connected with the growth of Intercolonial Trade is the construction of the Baie Verte Canal, across the Isthmus connecting the Provinces of Nova Scotia and New Brunswick. The advantages that must accrue, not merely to the Dominion as a whole, but to the commerce of the Maritime Provinces, are so clearly pointed out by the Boards of Trade of all the leading cities of Canada, and by men interested in the development of our commercial interests, not simply the merchants of St. John and other places in the locality of the proposed Canal, but merchants of Hamilton, Toronto, Ottawa, Montreal and Quebec, that it is superfluous for the Commissioners to do more than briefly refer to a few salient features of the scheme.

A steamer laden with flour for St. John, N. B., now goes down the Gulf as far as Shediac, where the cargo is transported by rail to its destination. The total distance by water from Shediac through the Gut of Canso and around the coast of Nova Scotia to the Bay of Fundy as far as the commercial Capital of New Brunswick, is about

600 miles, and the consequence is that there is little or no direct communication between the Bay of Fundy ports and those of the River St. Lawrence. By a Canal through the Isthmus the distance from Shediac to St. John will not be much more than one hundred miles."

"The construction of the proposed Railway has been submitted to Sir John Fowler, and the constructive details of making and working the line have been fully considered and approved by that gentleman, who has consented to act as Engineer-in-Chief. This Chignecto Railway, as finally decided upon, will be seventeen miles in length, will run through a practically level country, and will be laid with four lines of rails, over which the cradles in which the ships are placed will be conveyed. The steamers and sailing vessels to be transported will be limited to 1,000 tons register, and they will be of the class which, having small draught of water, are adapted for lake and inland navigation. These are necessarily unsuited to the stormy weather and the navigation of the Atlantic—hence the advantage of the proposed mode of transit."—*Railway News, London.*

"The cost of operating a Ship Railway may be ascertained by comparing it with the cost of working an ordinary railway. Mr. Corthell says:—

"The cost per ton per mile on the best railroads is 3 mills per ton per mile for through freight. From this should first be deducted the cost of such work as does not pertain to the Ship Railway. Deducting irrelevant items, we can properly reduce the cost 48 per cent., or to 1.56 mills; but a still further reduction is proper. Much larger loads are carried, the ratio of paying to non-paying loads is greater, the frictional resistance to the motive power is reduced at least 30 per cent., the rails are straight, the track perfect, the grades light, and greater results are obtained with less fuel and service. The above favorable conditions allow us to reduce the cost to 1 mill per ton per mile."—*Telegraph.*

"The Minister having referred the whole question to the Chief Engineer of government railways, he reports as follows:—

1. That the project is one quite practicable of execution;
2. That the Ship Railway as proposed would be a good substitute for the Canal originally contemplated;
3. That the advantage in respect of cost, as compared with that of a Canal, would be greater in favor of the Ship Railway, the cost of a half-tide Canal being calculated by the government engineers at from \$5,650,000 to \$8,217,849, whereas the subsidy asked for by the company, namely, of \$150,000 for twenty-five years, if capitalized at 4 per cent. would be equal to the sum of \$2,343,312 only."—*Report of Minister of Railways.*

THE MEXICAN SHIP RAILWAY.

"The Committee on Commerce, to whom was referred the bill (S. No. 430, 46th Congress,) to incorporate the Interoceanic Ship Railway Company, and for other purposes, have had the same under consideration, and beg leave to submit the following report:

The first question the committee considered was as to the practicability of constructing a Railway for the purpose of transporting ships and their cargoes. The testimony before the committee conclusively demonstrates the fact that such a railway is entirely practicable, and that loaded vessels can be transported over the same with absolute safety and economy.

In the first place the committee would refer to the testimony of Sir Edward J. Reed, K. C. B., late chief constructor of the British navy, who, in passing through Washington, kindly appeared before the committee at its invitation, and gave it the benefit of his views. The statement of Sir Edward Reed will be found printed in

ful in the testimony taken before the committee. Specific reference will now be made only to some of the matters therein contained.

In one part of his statement he says:

"I have no hesitation in saying that the modern ships of to-day are vastly stronger everywhere than they were half a century ago, and that they are now, as a rule, perfectly capable of being docked in dry-docks with their cargoes on board. Of course, if they can be docked in a dry-dock (a graven and sunk dock,) they could be docked upon an iron lifting or hydraulic dock."

Again he says:

"I should like to say at first that, as a naval constructor, I have no fear whatever of a ship undergoing any strain in the process of lifting out of the water (as would be necessary in the case of a Ship Railway,) that she is not liable to at present in ordinary docking. I would say, further, that I am quite sure that the processes of ordinary docking, as carried on in a vast number of private establishments, are very negligent and insufficient in comparison with those which would be adopted in the case of the hydraulic lifts connected with the proposed Ship Railway."

Again, in speaking of the allegation made by some that in the transportation of ships by railway there would be much jerking and vibration, which would be liable to cause damage, Sir Edward says:

"They seem to think there are no vibrations or jerking, or forces of some kind the ship would be subjected to on the railway that she is not subjected to at sea. That feeling, I know, is a pretty general one. I can only attribute it to the fact that the gentlemen who so think are not acquainted with the strains that ships undergo at sea."

Again he says:

"The next thing I would say is that we have ships on railways, and we have them in the worst form. Nothing is commoner than heaving up slips upon which ships are pulled up out of the water. They have to take their bearing first at the bow, and gradually come up until they get upon the solid, and are then hauled up by chains."

"That has been done everywhere, all over the world, thousands of times in this country, and it is now carried on to a very large extent indeed. With docks for ships of 3,000 or 4,000 tons, nothing is thought of pulling these ships up, and nothing is thought of any strains they undergo under the circumstances."

In speaking of the liability of ships while in transit to be blown over by violent storms, Sir Edward says:

"If it is sufficient on a Ship Railway to provide against something like the worst hurricanes at sea, then I have no hesitation in saying that it is perfectly impossible for these ships on the railway to come to any grief from wind, because the resistance to hold the ship upright on her cradle on the railway track is, I think, very many times greater than the forces which keep her upright at sea."

After speaking of the track and locomotives which would be required for the Ship Railway, Sir Edward says:

"With a track like that, and with locomotives adapted to it, there would be no difficulty in transporting ships. It would be best to avoid a very high rate of speed. It would not be necessary, I should think, to move these ships at a greater speed than eight or ten miles an hour, although I am quite prepared to believe that, with a proper track and locomotives, vessels could be transported much faster."

Mr. William John, who was for some years the scientific adviser of the committee of Lleyd's Register of British Shipping, London, and who built the Inman steam liner the City of Rome, in a letter dated October 6, 1881, says:

"The practice of lifting a ship of large size clean out of the water has become an

every-day occurrence. The further step of lifting her to a considerable height is not a great one, especially if you can start with her floating in a considerable depth of water. Beyond these the conveyance of her over a railway, provided the latter is moderately level and moderately straight, is a simple matter, which is certainly not outside the reach of civil engineers."

Mr. William Pierce, sole proprietor of John Elder & Company's works, Govan, Glasgow, and who built the Arizona, the Elbe, the Alaska, and others of the largest and finest steamers afloat, in a letter dated August 26, 1881, says:

"I am of the opinion, from what I know of the working of iron floating docks that I have designed and built, that iron steamers of 4,000 to 5,000 tons' displacement may be docked loaded, without any injury whatever. It is also my opinion that a Ship Railway for vessels of this size may be constructed and worked successfully, provided the land is solid and the line moderately level."

Nathaniel Barnaby, C. B., present chief constructor of the British navy, in a letter dated London, October 8, 1881, says:

"I note, therefore, the question you wish to put to me, which is: 'Do I think the problem insoluble of constructing a car on which a fully loaded ship can be safely transported over such a railway as could be built through a tolerably level country?'

"In reply to this, I say not only that it is soluble, but that the solution is, in my opinion, fairly indicated in your plans, as laid before the committee on interoceanic canals and shown to me.

"Ships which would be strained by ordinary docking would be liable to be strained also when suspended on a car not specially designed for their crazy condition, but such ships would be still more strained in their ordinary sea passages."

Mr. William F. Buckley, president of the New York Balanced Dock Company, in a letter to Mr. Eads, dated February 14, 1881, gives the following list of vessels taken out on his dock with cargoes in them:

"Ship Great Victoria, 2,386 tons; ship Triumphant, 2,046 tons; ship America, 2,054 tons; ship Hagerstown, 1,903 tons; ship S. C. Blanchard, 1,903 tons; steamer Colorado, 2,765 tons; steamer Rio Grande, 2,565 tons; steamer Thingvalla, 2,436 tons; steamer Monarch, 2,366 tons; steamer Lepanto, 2,310 tons; steamer State of Nevada, 2,488 tons."

And says:

"We do not refuse any class of ships or steamers, even with their coals and cargoes on board, whose length does not exceed the length of the dock. In every case in which we have taken up steamers with cargoes in, it has been done without the least strain of injury to the vessel. As the rule is to make a charge for raising cargo in the vessel, they usually come without cargo."

"Captain Eads's proposed Ship Railroad has a precedent in Germany, where vessels of sixty tons capacity are carried overland from the upper to the lower part of the Elbing-Oberland Canal, in West Prussia. This Ship Railroad has been in successful operation for over sixteen years, but when the idea was first broached it was ridiculed by everybody. Even then, however, there had been a precedent for the scheme in a road over our Alleghany range, on which canal boats were carried."—*American paper.*

"A screw steamer has been transported, without a strain, fifty miles by rail from Pensacola Bay to a lake in Walton County, Florida."—*Detroit Free Press, June 5th, 1886.*

BOMBAY HYDRAUTIC LIFT.

"The Peninsular and Oriental Steam Navigation Company having taken over from

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the Indian Government their large Hydraulic Lift, capable of docking vessels of any size and draft up to 5,000 tons, they desire to call the attention of Shipowners to the great advantage of this additional docking facility in Bombay, where, owing to the dry climate and cheap labour, such work can be better and less expensively performed than at most home ports.—For further particulars apply to PENINSULAR & ORIENTAL STEAM NAVIGATION COMPANY, LONDON OR BOMBAY."—*Advertisement in Liverpool paper.*

"I have but one opinion regarding the question—which is, that ships of the largest class, loaded with full cargoes can be safely lifted, and transported in the manner proposed without subjecting them to any more strain than they would undergo during a sea passage, and in fact much less fatigue than they would encounter during gales of wind such as ships are at times subjected to in all oceans of the world"—*A. K. Miller, of A. K. Miller & Co., New Orleans.*

"In reply to your questions, I would state that I was manager and Superintendent of the Marine Railway at Nassau, N. P., Bahamas, for ten years, and during that time—as near as I can remember—I hauled out and repaired between 800 and 900 vessels, about one-third of which were steamers, and perhaps one-fifth of them loaded.

"As we charged so much per ton for cargo on board, as far as practicable the vessels were discharged before being taken out.

"My experience was that it was easier and safer to take out a loaded vessel than one in ballast. The railway was about 800 feet long, and similar in all respects to your model, the principle being the same. There was not one dollar's damage done to any vessel in hauling out while I had charge of the railway."—*Epes Sargent.*

"For nearly fifty years, I have been more or less connected in some manner with Ship Railways; and for many years with all classes of docks and ways, for hauling out and repairing ships, and for about thirty-eight years, have owned a Marine Railway, and we have often taken ships out full of cargo and water. From the information which I have derived from you and your plans, I have no doubt but that your enterprise will be a success; and I trust you will soon have the great pleasure of seeing it in full and complete operation."—*D. D. Kelly, East Boston.*

"A Boat Railway has existed in Cornwall since 1826, and is at this moment, I believe, in full employment. The Bude Canal was designed by Mr. Green, and cost Lord Rolle £128,000. It runs between Bude and Launceston, and is twenty miles long. At Hobbacote Down the canal boats ascend the uplands by an inclined plane 900 feet long, provided with two lines of rails terminating at each end in the canal. The boats are provided with small iron wheels to fit the rails, and are raised by an endless chain, moved by two vast tanks, alternately filled with water and descending into wells 220 feet deep. There are seven of these inclined planes. The canal is situated in a remote and unfrequented part of the country, and is so ingenious that I make no excuse for troubling you with this letter."—*Letter of G. Buckston Brown to Pall Mall Gazette.*

EXAMPLE OF A CANAL BOAT RAILWAY IN THE UNITED STATES.

"If further assurance of the ability of ships to safely endure out-of-water handling were required, it might readily be found in the every-day handling of loaded canal boats at portages. In staunchness a sea-going vessel compares with a canal boat about as a well-made beef barrel does with a cracker box; and the capacity of canal boats to endure railway carriage was amply demonstrated forty years ago on the Portage Railroad of the Allegheny Mountains. To connect the canal systems of Eastern and Western Pennsylvania, a system of gravity railways with ten inclined planes was constructed between Hollidaysburg and Johnstown, thirty miles or more apart 'as a bird flies;' and up and down these steep inclines the large boats of the 'Pioneer Packet Line' made regular trips until the Pennsylvania Railroad was built."—*Scientific American.*

"It appears to be a settled conclusion that the little Isthmus of Chignecto is to claim the glory of possessing the first Ship Railway of modern times. Doubtless there are many who do not see the force of this reference to *modern times*, but let us say that as in many other achievements in which the people of the past ages eclipsed us, so it was in transporting vessels overland from sea to sea. Grecian excavations have unearthed the remains of a road which had polished granite in place of rails, and was in use 500 B. C., and for about two centuries later. It was called the 'Diolcus,' and extended from the harbor of Schœnus to the eastern part of Port Lechæum, obviating the danger of Cape Malea. The founder of the 'Swedenborgians'—Count Emanuel Swedenborg—who was also an engineer, designed and put in operation a road twenty miles long, for conveying loaded vessels over the mountainous country between Stromstadt and Idefjal, in Sweden. We cannot say how long this 'rolling-machine' was in use, but in 1718 Charles XII employed it during the war with Russia in transporting cannon and sloops of war."—*Amherst Gazette*, Dec. 11th, 1885.

The alternative project of a Ship Railway at Suez was very thoroughly considered by two prominent engineers, Messrs. Brunles and Webb, of England, who also made surveys and projected a Ship Railway for an interoceanic crossing between the Atlantic and British Honduras.

"A ship, they say, is a structure made to float in the water, buoyed up by a mobile substance, the nature of which not only prevents unequal strains upon the ship from her general weight, but also helps her to resist the internal or bursting strain of her own cargo. Out of her proper element, they argue, all these conditions are reversed.

"In answer to these apprehensions it is enough to say that they are founded in a view of the case which every shipbuilder knows to be altogether inconsistent with fact. A ship afloat is not uniformly buoyed up by the water. On the contrary, especially where there are waves of any magnitude, a ship's support is not only unequal, but incessantly variable as to position. This fact is so well recognized by ship-builders that every sea-going vessel is so built as to be able to bear her entire weight when supported only at the ends, or to withstand the strain of being held up wholly at the middle, with both ends unsupported in the air. If a ship is unable to endure these severe tests she is unfit to battle with the waves. As for the bursting strain of a cargo, with or without a counter pressure of water outside, every ship at sea has to withstand it, more or less completely, with the passage of every large wave; while at the same time she is buffeted with heavy seas, which strike with blows like those of a battering ram. Indeed it would hardly be possible to devise an apparatus capable of subjecting a ship to so frequent and severe horizontal, lateral, and torsional strains as a ship endures in every gale. In comparison with them the strains that would be put upon a ship in transit over a properly constructed railway would be as nothing. On the railway carriage the ship would rest on an even keel, uniformly supported from stem to stern, and as secure from lateral and twisting strains as when cradled in a dry dock; while the forward motion of transit over easy grades would be less trying even than that which ships are constantly subjected to in well-known marine railways connected with ship-yards."—*Scientific American*.

"We do not doubt the commercial advantages of the work. No one can question that if the Isthmus of Chignecto were removed, uniting the waters of the Bay and Gulf, that a tonnage amounting to hundreds of thousands, if not millions, would pass each season, between the continent north of us and the continent south. The Ship Railway is a cheap method of removing the Isthmean obstruction to navigation."—*Amherst Gazette*.

"The work that was to be done by the Ship Railway is to be carried out on a small scale on the French lines which connect Brest and Toulon. Early next month a train will leave Brest carrying on five specially adapted luggage trucks a first-class

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torpedo-boat of no less than 35 metres in length. Readers will better judge of what this means when I add that the length of our longest luggage railway truck would probably not exceed $8\frac{1}{2}$ metres. It is only a modest beginning, but who is to say that the day may not yet come when ironclads blockaded in one harbor, say, shall be run over the metals to another part of the country and launched again on their native element?"—*English paper.*

CHIGNECTO SHIP RAILWAY.

"This project should not be lost sight of; it should be vigorously advocated by our people for the purpose of making our city a mart for maritime trade between the Gulf ports on the one side, and the United States and the West Indies on the other. The ablest and most farsighted commercial men our city has possessed in the past never doubted that the construction of the Baie Verte Canal would give an enormous impetus to the trade and business of this city. A glance at the map is sufficient to show any one that a short cut for vessels over this Isthmus would virtually make the Gulf of St. Lawrence and Bay of Fundy one continuous sea, and open to us vast possibilities in trade and shipping from which we are now debarred."—*St. John Telegraph.*

"POEVER, KNUTSFORD, July 24, 1883.

"DEAR SIR,—I enclose you list of steamers and sailing ships lifted at the Malta Hydraulic Dock, from 1876 to 1883, with cargoes. In no single instance has there been the slightest accident or injury to any of the vessels, or complaint from owners or captains. In my opinion, any number of ships can be lifted with cargoes without any injury whatever to them.

"I remain, yours truly,

"J. P. EMMERSON."

ANGLO MALTESE HYDRAULIC DOCK.—LIST OF VESSELS DOCKED WITH CARGO OR BALLAST.

NAME.	GROSS TONNAGE.	CARGO (TONS).	TOTAL DEAD W'GHT.
Isa Craig, Steamer.	1100	180	1419
Alice Otto, do.	1267	700	2255
Egbert, do.	1717	1600	3314
Volmer, do.	1531	1200	2645
Magdala, do.	2134	1700	3236
Hytton Castle, do.	1258	250	1823
Burmese, do.	1951	150	1961
Arabean, do.	2066	180	2917
Silistria, do.	1019	150	1168
Good Hope, do.	1555	1500	2984
J. W. Barber, do.	1443	1140	2580
Crimdon, do.	1710	1334	3044
Compton, do.	1804	1008	2878
Telephone, do.	1249	400	1697
Vortegern, do.	1362	420	2069
Cephalonia, do.	1200	120	1425
Tom Martin, do.	1400	1370	2511
Florence Richards, do.	1051	1500	2551
Cædum, do.	1271	850	2121
Eastminster, Ship.	1208		1418

"We, shipowners and masters, having experience of the coast of Nova Scotia, have no doubt whatever that a saving of 10 to 14 days would generally be made by sailing vessels clearing from Miramichi and ports West as far as Quebec, and making for St. John, N. B., Portland and Boston, by using the Ship Railway, and so avoiding the weathering of Cape North and Cape Canso as by present route.

"We believe, too, that laden vessels would not be injured on the Railway if supported in a properly made cradle, such as is used on all marine slips; and we know that ships are purposely stranded at low tide all along the Bay of Fundy for receiving and discharging cargo, and that the vessels that could stand this are not likely to sustain any damage by being transported with cargoes over a Railway.

"We are, yours very truly,

F. C. MAHON, of T. & E. KELLY, 161 Gresham House.
MEEBILLINGS & Co., 9 Great St. Helens, London.

(Sgd) G. T. Soley & Co., Liverpool.	(Sgd) John Robertson, Liverpool.
" Robert K. Kelly, "	" James Sutherland, "
" H. Barss & Co., "	" D. B. Lawson & Co., "
" Chas. E. DeWolf & Co., "	" E. B. Hatfield, "
" Geo. A. Belyea, "	" R. C. Hawa, "
" E. F. Irvine, "	" Albert Armstrong, "
" T. C. Jones & Co., "	" W. D. Nelson, "
" Henry Lovitt, "	" William Lynch, "
" E. F. & W. Roberts, "	" James M. Allen, "
" John R. Hawe & Co., "	" Jas. F. Cruikshank, "
" J. F. Fraser, St. John, N. B.	" J. W. Holmes & Co., "
" Black, Moore & Co., L'pool.	

"This year (1884), I have the names of 1,700 vessels, and I can safely say that 500 more I had not taken as they anchor in Port Hawkesbury, but you can safely say that 2,000 vessels pass to and fro through the Strait of Canso."—*David Murray, Jr.*

SAVINGS OF DISTANCE.

The saving in distance to be effected by the Ship Railway is certified by the late Mr. Wyld, Geographer to the Queen, to be 500 miles to St. John *via* Straits of Canso from all points West of the Gulf Terminus of the Ship Railway.

It would be about 700 miles of saving over a voyage by Cape North around the Island of Cape Breton.

These distances are measured in the route steamers would take, which is more direct than that of sailing vessels, therefore the saving of distance would be much greater for sailing vessels.

It is estimated that 9 or 10 days would be saved by a sailing vessel going from Summerside to St. John.

The saving of distance from the Gulf Terminus (Tidnish Head) is as follows :

	VIA CANSO.	VIA CAPE NORTH.
To St. John,	500 Miles.	700 Miles.
" Parrsboro,	560 "	760 "
" Truro,	560 "	760 "
" Joggins,	600 "	800 "
" Moncton,	640 "	840 "
" Portland,	320 "	520 "
" Boston,	300 "	500 "

The route *via* Cape North is preferred by large sailing vessels which are liable to be detained at Canso by contrary winds, fog, etc.

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CHIGNECTO MARINE TRANSPORT RAILWAY.

Tonnage of the Ports in the Gulf of St. Lawrence and Bay of Fundy affected by the Isthmian Transit, compiled from Trade and Navigation Tables, June 30, 1886.

GULF AND BAY PORTS.	ENTRIES.	CLEARANCES.	TOTAL.
Gaspe	56,798	53,134	109,932
New Carlisle	154,208	154,529	308,737
Perce	42,986	42,285	85,271
Quebec	1,183,554	1,121,037	2,304,591
Rimouski	9,291	9,235	18,526
Pictou	276,381	278,507	554,888
Hawkesbury	99,289	82,560	181,849
Port Hood	4,213	3,079	7,290
Bathurst	19,020	18,758	37,778
Caraquet	6,094	5,557	11,651
Chatham	80,427	78,020	158,447
Dalhousie	48,512	46,650	95,162
Newcastle	40,286	42,920	83,206
Richibucto	19,360	20,876	40,236
Shippegan	1,804	1,780	3,584
Charlottetown	493,692	423,515	917,207
Summerside	38,578	17,019	55,597
Total	2,574,486	2,399,459	4,973,945
Amherst and Tidnish	59,636	62,165	121,801
Annapolis	53,835	53,598	107,433
Bridgetown	3,955	3,931	7,886
Cornwallis	21,268	26,742	48,010
Digby	132,742	126,949	259,691
Londonderry	8,644	8,638	17,282
Parrsboro	60,033	69,878	129,911
Windsor	74,469	67,409	141,878
Yarmouth	102,479	105,343	207,822
Campobello	20,664	21,509	42,173
Dorchester	6,554	6,743	13,297
Hillsboro	35,410	35,038	70,448
Moncton and Shediac	161,001	163,511	324,512
Sackville	16,157	15,194	31,351
St. Andrews	91,409	89,183	180,592
St. George	6,382	6,506	12,888
St. John	688,268	696,705	1,384,973
St. Stephen	12,308	12,144	24,452
Total	1,555,204	1,571,156	3,126,360
Grand Total of Shipping (tons)			8,100,305

SUMMARY AND CLASSIFICATION OF SHIPPING TONNAGE.

PORTS OF GULF OF ST. LAWRENCE.

	Arrivals.	Departures.	Total.
Seagoing Tonnage.....	982,456	929,668	1,912,124
Coastwise Steamers.....	1,266,960	1,251,305	2,518,265
Coasting Sailers.....	325,070	218,486	543,556
	<u>2,574,486</u>	<u>2,399,459</u>	<u>4,973,945</u>

PORTS OF BAY OF FUNDY.

	Arrivals.	Departures.	Total.
Seagoing Tonnage.....	926,852	964,963	1,891,815
Coastwise Steamers.....	330,797	333,453	664,250
Coasting Sailers.....	297,555	272,740	570,295
	<u>1,555,204</u>	<u>1,571,156</u>	<u>3,126,360</u>
Grand Total of Tonnage.....			8,100,305

N. B.—The above tonnage does not include that of Montreal or of Portland and Boston, or the fishing fleet which, in estimating the tonnage to be transported by the short cut of the Isthmus, should be taken into account.

LIST OF STEAMERS

Plying in the Gulf of St. Lawrence and Bay of Fundy, all of which can be easily Transported over the Ship Railway in two hours, with their Cargoes:

Empress,	930 tons.
Princess of Wales,	936 "
St. Lawrence,	846 "
Rothsay,	839 "
Prince Arthur,	545 "
Miranichi,	727 "
Saguenay,	1077 "
Secret,	467 "
Dominion,	601 "
Alexandra,	1063 "
Flamboro,	993 "
Napoleon III,	749 "
Newfield,	785 "

NAVIGATION OF THE BAY OF FUNDY.

The following is an Extract from the Report of Samuel Keefer, M. Inst. C. E.:

"The Bay of Fundy is remarkable for the extraordinary range of its tides. It is one of the wonders of the world, and the wonder is, that such a prodigious volume of water as enters and leaves it twice a day does not produce a greater commotion. On the direct course up the Bay to Cumberland Basin, and in the Basin itself, there is no bore; the water being too deep and the course too direct to admit of such a phenomenon. Having observed the operation of the tides, both at Laplanche and Au Lac, I was surprised to see with what ease and regularity it was done. The surface of the great Basin rises and falls almost imperceptibly, all the while observing, in the absence of any wind, the placid appearance of a lake. The range of the tide at St. John is 27 feet for springs and 23 for neaps, while according to the Departmental survey, it is 48 feet for springs and 38 for neaps at the head of Cumberland Basin."

The estimate of 600,000 tons before given as the probable amount of traffic over this Railway is, therefore, only $7\frac{1}{2}$ per cent. of the above tonnage.

The Board of Trade of St. John, New Brunswick, passed the following resolutions on the 20th October, 1883:—

"*Whereas*, means of communication between the waters of the Bay of Fundy and the Gulf of St. Lawrence, whereby products of the several Provinces bordering thereon may be interchanged without encountering the dangerous navigation of the Atlantic coast of Nova Scotia, whereby steamers and sailing vessels, adapted as well for inland as for ocean navigation, may be safely conveyed across the Isthmus of Chignecto, without the cost and delay of transshipment or breaking bulk and whereby the sailing distance between this port and all ports north and west of said Isthmus may be reduced about 600 miles—would materially increase the volume of trade and benefit the shipping interests of this port and other ports in the Bay of Fundy and Gulf of St. Lawrence; and

"*Whereas*, by means of a Ship Railway across the Isthmus, the objects aforesaid may be accomplished and thus stimulate the development of the agricultural, mining, lumbering and fishing resources of the district contiguous to the aforesaid ports; and

"*Whereas*, a company has been formed for the construction and operation of a Ship Railway with commodious docks and hydraulic lifts for raising and transporting over its line laden vessels of 1,000 tons register; therefore

"*Resolved*, That this Board is of opinion that the undertaking of said company would greatly facilitate trade and commerce between the eastern and western provinces; and further

"*Resolved*, That this Board cordially approves the project for building the said Ship Railway, believing that this is a movement which will commend itself to all classes, and prove to be of great convenience and benefit to our trade and commerce generally."

NOVA SCOTIA MINERALS.—STATISTICS OF PRODUCTION DURING THE TWO PAST YEARS.

The Report of the Commissioner of Works and Mines gives the following summary of the mineral production of Nova Scotia during the year 1886:

	1885.	1886.	
Iron Ore,	48,129	44,388	Tons.
Coal raised,	1,352,205	1,502,611	"
Gypsum,	87,044	123,753	"
Building Stone,	3,827	8,000	"
Coke made,	30,185	31,604	"
Limestone,	16,428	20,265	"
Grindstones, etc.,	2,208	1,600	"
Antimony,	758	645	"
Manganese Ore,	353 $\frac{1}{2}$	427	"
Barytes,	300	230	"

"There is no public work now presented to the Dominion which will be so far reaching in its beneficial consequences not only to Canada, but to the whole of the Atlantic coast of North America. This Canal means, for Ontario and Quebec, cheaper coal, iron, stone, fish, leather, etc.; for Nova Scotia and New Brunswick, a better market for all these. It means cheaper flour and other products of the Upper, to us of the Lower Provinces—a larger market or rather greater facilities for supplying the United States, the West Indies and South America, with what we are now prevented from sending, owing to the distance and cost. It means to us *all* an immensely extended commerce."—*Evidence of Hon. Senator Boyd.*

CHIGNECTO MARINE TRANSPORT RAILWAY.

Estimate of the Probable Traffic to be Developed by the Proposed Isthmian Transit.

ARTICLES OF COMMERCE.	FROM.	TOWARDS.	TONS.	AUTHORITY.
<i>Products of the Forest.</i> —All kinds of short or small lumber, planks, deals, boards, battens, scantling, clapboards, cedar and pine shingles, laths, palings, pickets, ship timbers, knees, masts, spars, cedar sleepers, pine hachmats railway ties, telegraph poles, spiling, hemlock bark, hemlock boards, staves, hoops, sugar box shooks, black ash, elm, maple. Pine boards, oak, elm, walnut, ash.	The north shore of N. Brunswick, N. Scotia, Bay Chaleurs and Gaspé Basin. Estimated at forty million superficial ft. Quebec.	St. John, United States, West Indies, Guiana, Brazil, Buenos Ayres. Total tons..	80,000	Sen. Muirhead, W. Elder, M.P.P. Ed. Jack, C. E. F. C. Winlow. Hon. J. W. Lawrence. Hon. J. Boyd. J. Pickard, M.P.
<i>Products of the Western Provinces.</i> —Flour, meal, barley, oats, corn, wheat, pork, beef, hides, mineral oil, agricultural implements, machinery and other heavy manufactures, phosphates, ores, etc.	Montreal, Toronto, Chicago, and all lake ports.	Coming in the lake propellers to St. John, can there exchange for southern products, and coal, plaster and stone. Total tons..	50,000	J. Pickard, M. P. Hon. J. Young at meeting of Dominion Board of Trade in 1871 Hansard, 1870, p. 1,144.
<i>Agricultural and Animal Products from Prince Edward Island and Cape Breton (west coast).</i> —Potatoes, roots of all kinds, oats, beans, peas, pressed hay, lard, tallow, wool, horses, cattle, sheep, swine, dairy produce, poultry, hides, pelts.	Ports of Charlotte town, Summerside, Georgetown.	To St. John, Portland, Boston, Providence, New York, West Indies. Total tons..	50,000	C. Burpee, M. P. Hon. J. C. Pope. J. C. Hall. W. Elder, M. P. P. Hon. J. S. Carvell
<i>Products of the Sea and the Fisheries of the Gulf of St. Lawrence.</i> —Fish of all kinds, cured, frozen, pickled, canned, dried or alive; cod, halibut, mackerel, lung, pollock, salmon, capelin, herring, smelt, alewives, lobsters, oysters; also cod, seal, porpoise and whale oils.	Labrador, Anticosti, Bay Chaleur, Gaspé basin, P. E. Island, and the Gulf waters generally and from Quebec.	Ports of the U. States, north and south, Cape Cod, New Bedford, Gloucester, New York, New York, New Orleans, West Indies, Brazil, Buenos Ayres. Total tons..	60,000	R. G. Lunt. J. C. Hall. W. Elder, M. P. P. Hon. R. Marshall C. Milner. Alex. Wright.
<i>Products of Mines and Quarries.</i> —Coal from Pictou for steam purposes; free-stone, plaster, rough and calcined, grindstones, marble and slate, and ores. Coal from Sydney, via St. Peter Canal.	Pictou, Port Hood, Wallace, Cape Breton (west coast), Gloucester. New Sydney.	To United States ports, West Indies, St. John. St. John. Total tons..	50,000	H. A. Budden. F. Newbery. Hon. J. Boyd. A. Wright.
<i>Miscellaneous Products.</i> —Merchandise, vessels seeking short cut and looking for cargoes; steamers, tugs, schooners and small craft generally going to winter in St. John.	Quebec and Gulf ports, P. E. Island.	To United States, and to St. John, and to winter in Bay of Fundy. Total tons..	15,000	Report on Bale Verte Canal, p. 11. C. Burpee, M. P.
RETURN TRADE.				
<i>Tropical and Semi-tropical Products.</i> —Sugar, molasses, cotton, coffee, hides, tallow.	S. America, Brazil, Guiana, West Indies, Southern States, and exchangeable at St. John for Western Canadian products and manufactures.	To Montreal, Quebec, Toronto, and all lake ports, also to Gulf ports and P. E. Island. Total tons..	60,000	Hon. J. Boyd. Hon. J. Young, speech at Dominion Board of Trade, 1871. J. Pickard, M. P. C. Milner.
<i>Products of the Mine.</i> —Bituminous coal of Nova Scotia.	From collieries of Cumberland Co., St. H. Joggins, Spring Hill, Hilliard, Lawrence, Milner and other mines at Maccan and River Hebert.	Montreal, Toronto, Quebec, and all lake ports, also to P. E. Island and all Gulf ports. To same ports. St. John and direct.	80,000	Quebec Board of Trade. J. W. Lawrence. Alex. Wright. C. Milner. Hon. J. Boyd. Sen. Dickey. Hon. W. Muirhead.
Also anthracite coal from Pennsylvania.	via St. John and direct.	Total tons..	80,000	
			Carried forward	445,000

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ARTICLES OF COMMERCE.	FROM.	TOWARDS.	TONS.	AUTHORITY.
<i>Products of the Quarry.</i> —Olive, grey and brown freestone.	Dorchester, Hope-well, Harvey, St. Mary's Bay, Wood Point, St. George, Charlotte, St. John County, Londonderry Mines, Five Islands and Min-die.	Brought forward.. Quebec, Montreal, To-ronto, and all cities and towns of the western provinces.	445,000	Hon. J. W. Law-rence. Hon. J. Boyd. Hon. R. B. Dickey
Red granite. Grog granite. Iron, marble, lime, grindstones, scythe and whet stones and ore.	Windsor, Martin's Head, Hillsboro, Shepody.	To Ontario and the West.	Total tons.. 50,000	J. G. Tompkin. W. Elder, M.P.P.
Plaster (gypsum) in the rough, used as a fertilizer, and manufactured calcined plaster.	United States, St. John, and Bay of Fundy ports.	To Quebec and all Gulf ports.	Total tons.. 40,000	Hon. J. Young, Chamber of Commerce, St. John. J. Pickard, M. P.
<i>Merchandise, Manufactures and Supplies.</i> —Being the return propeller cargoes in exchange for lumber from North Shore N. B., N. S., and Quebec, and agricultural products of P. E. Island.	Untitted in Bay of Fundy or St. John.	For the Gulf Fisheries, Labrador, Anticosti, Bay Chaleur, Gaspé Basin.	Total tons.. 65,000	Hon. J. W. Law-rence. Senator Dickey.
<i>Miscellaneous.</i> —The fishing fleets with bait and supplies, and other cargo, ves-sels seeking cargoes, steamers, tugs, smacks and small craft.			Total tons.. 30,000	
		Grand Total..	600,000	

**This item will be considerably increased when the fishery question is settled with the United States.*

EXTRACT FROM THE REPORT OF SIR JOHN FOWLER, K. C. M. G., C. E.

"The information obtained by my partner, Mr. B. Baker, when inspecting the site of the proposed works in October last, enables me to confirm the opinion I have from time to time expressed as to the entire practicability of the proposed Ship Railway, and the Hydraulic Lifts and Docks connected therewith, and the fitness of the designs to effect the object of the undertaking.

"The lifting of vessels with cargoes is now of common practice, with even double the tonnage contemplated to be transported on your Railway, without doing any injury or subjecting the vessels to any strain beyond what they were designed to withstand in the ocean.

"It is a great advantage to have found a straight line coupled with very favorable gradients. With the slow speed contemplated, the substantial design of the permanent way and all the various works, the cost of working expenses must necessarily be very moderate.

"With regard to the time within which the entire works can be completed, I am of opinion that the entire undertaking can be carried out within 2½ years from the commencement, the machinery being finished and in operation some months earlier.

"I am, Gentlemen, your obedient Servant,

"(Signed)

JOHN FOWLER.

"To the Directors of the Chignecto Marine Transport
Railway Company, Limited."

"The views of Sir John Fowler are entirely supported by Mr. Collingwood Schreiber, the Chief Engineer of Canadian Government Railways, who, in his Report to the Secretary of the Department of Railways and Canals, refers to the proposal of this undertaking as follows: 'This project I consider quite practicable; the construction of a substantial Ship Railway * * * being, in my opinion, a mere matter of cost, which, there is no doubt, can be accomplished with skill and money.'—*Report of Mr. Collingwood Schreiber.*

REVENUE.

Assuming that 600,000 tons of merchandize will annually pass over the line, it will require an equal amount of register tonnage of hulls to carry that amount.

The revenue greatly depends on the manner of regulating the tolls, but the following general principles will be observed :—

1. To encourage and develop non-existent trade by low rates at first until the Railway is worked up to its full capacity.
2. To discriminate as to nature of cargo, its destination and distance travelled.
3. To compete with freights around Nova Scotia.
4. To make a charge on the hull as well as on the cargo.
5. To regulate the charges on the cargoes by weight, measurement or capacity.
6. To make special rates for regular running lines of steamers.

A fair general average rate would be fifty cents per ton on the cargo and ten cents per ton on the hull.

The revenue at this rate would be : 600,000 tons at 60 cents, \$360,000.

WORKING EXPENSES.

It is obvious that the whole load transported is a paying one, excepting the cradle. That is to say if 1,000 tons weight be carried on a cradle weighing but 250 tons, as estimated, the paying load bears to the dead weight the proportion of four to one.

It is therefore a freight line wholly.

The speed slow.

Fuel cheap.

The line straight. Gradients almost level.

No station expenses.

The freight loads and unloads itself.

Works so substantially built that repairs and maintenance will be light.

The cost, therefore, of working will be but little more than inexpensive maintenance and locomotive power, added to the cost of lifting and depositing vessels from and to the docks.

The proportionate cost of locomotive power to gross earnings in English railways is $17\frac{1}{2}$ per cent.

The transportation will cost about half a cent a ton per mile, the maintenance of the permanent way and works about \$1,700 per mile per annum, and the working of the machinery of the Hydraulic Lifts about \$20,000. A careful calculation of the whole cost of the working expenses shows they will come under 30 per cent. of the receipts. A considerable revenue may be derived from the Hydraulic Lifts at each terminus if used for cleaning and repairing vessels, and during the winter when the Railway will not be used for transportation purposes, any number may be placed on the Railway for the purpose of repairs, and at the same time give employment to the staff of mechanics during that season.

HISTORY OF THE PROJECTED BAIE VERTE CANAL.

The history of the Canal project sufficiently demonstrates the importance of an Isthmian transit. The failure to commence the construction of a Canal may be attributed to the constantly increasing demands of commerce since its first inception, requiring additional dimensions to satisfy the growing trade; the differences of engineers as to the sources of supply of the feed water; its great cost growing with every survey; the uncertainty of its fulfilling the actual requirements of the present day; its incapacity to carry steamers of the size now used in the Gulf of St. Lawrence; the general unbelief that with the excessively slow passage of vessels through a Canal it would really be so advantageous as a Ship Railway, and because of the Report of the Commission of 1873 (Hon. John Young, Chairman,) wherein the distance to be saved from Baie Verte to St. John was misrepresented by 200 miles.

In 1822, a survey was made by the New Brunswick Government for a Canal to be fed by fresh water with a depth of *four* feet.

In 1825, another survey was made by Francis Hall, C. E., for a Canal having a depth on the lock cills of *eight* feet.

In 1826, Thomas Telford, the celebrated Scotch Engineer, reported on the survey of Mr. Hall, recommending larger dimensions and a depth of *thirteen* feet.

In 1843, Captain Crawley, Royal Engineers, after making a survey at joint expense of New Brunswick, Canada and Prince Edward Island, pronounced Canal of even *nine* feet depth impracticable on account of deficiency of fresh water supply; and he objected to using Bay of Fundy tidal water to supplement the deficiency, on account of its turbid nature and great quantity of mud held in suspension in that water.

In 1869, John Page, Chief Engineer, Public Works of Canada, is of opinion that by adopting a *lower* level an abundant supply of fresh water may be obtained, and that the Bay of Fundy water should be prevented from entering the Canal.

In 1872, Mr. Baillarge recommended water supply to be taken from Bay of Fundy, by using one or two rivers as reservoirs and settling ponds, and a navigable draft of *fifteen* feet.

In 1872, Messrs. Keefer and Gzowski recommended a half-tide Canal, twenty miles and a half long, at a cost of \$5,317,000.

In 1871, Mr. Baillarge estimated a Canal based on Mr. Keefer's project for 12 hours, at \$5,650,000
 And based on his own project for 16 hours, 8,217,849
 Also cost of a whole-tide Canal, 8,592,849

Total length of Canal, nineteen and a quarter miles.

In 1873, Mr. Page condemns Mr. Keefer's project and approves Mr. Baillarge's, and submits estimates of cost as follows:—

For a half-tide Canal,	\$7,700,000
Three-quarter-tide Canal,	8,100,000
Full-tide Canal,	8,500,000

He reports "that the construction of a navigable channel between the Bay of Fundy and the Gulf of St. Lawrence, on any line that can be selected, will be an undertaking attended with unusual difficulty, not only from the nature of the work to be done, but from the great difference in the elevation of the respective tides."

The locks were to have a width of 40 feet, and the Canal a navigable draft of sixteen feet.

The sum of \$8,500,000 would scarcely have been sufficient, if land damages had been included, and as it would have taken at least six or seven years to complete, the interest during construction would have increased the total cost to about \$12,000,000.

The width of the locks was not sufficient to admit paddle-wheel steamers, which must be the chief means of transport for general merchandise, being especially suited for the shallow harbours of the Gulf of St. Lawrence.

The importance of the omission to provide for the transfer from Gulf to Bay of the most numerous tonnage of the inland coasting trade of Canada may be illustrated by the fact that in 1882, out of 14 million tons of entries and clearances not less than 8,394,000 tons consisted of paddle wheelers; and out of all these steamers now plying in the Bay of Fundy and Gulf of St. Lawrence not one could have passed through the canal.

ADVANTAGES OF A SHIP RAILWAY.

The advantages that a Ship Railway would possess in this locality over any Canal, are self evident, and may be enumerated as follows:—

“The Ship Railway can transport vessels of greater width and draught than the proposed Canal was designed for.

“It would be open for the transport of vessels at an earlier date in the season than a Canal could possibly be, and could be used when the Gut of Canso is closed by ice.

“The transportation of vessels would be more quickly performed.

“The execution of the work would take but one-third the time.

“Its cost is but one-fourth that of a Canal that would accommodate the same sized vessels.

“The maintenance, repairs, and operating are less expensive owing to the difficulty there would be in keeping the works of a canal free from injury by frost and ice. Owing to the fact that in summer, southerly winds prevail with the regularity of trade winds, it would then be almost impossible to sail a vessel through the Canal from the Gulf of St. Lawrence to the Bay of Fundy; the task of towing would be nearly as expensive as transportation by rail.

“The capacity of the Ship Railway can likewise be more easily increased to meet the demands of commerce, whether as to size of vessels, or as to the number of them.”

DESCRIPTION OF THE SHIP RAILWAY.

The length is to be seventeen miles.

There is to be a Dock at each end of the line, where vessels will be received in quiet water previously to transportation.

In each of these docks there will be erected an Hydraulic Ship Lift, somewhat similar in construction to those in operation at the Victoria Docks on the Thames and at Malta and Bombay.

These Lifts will be especially designed to raise loaded steamers with absolute safety. A Ship Carriage or Cradle resting on wheels and provided with keel blocks and bilge guards will be first placed on the rails which rest on the gridiron of the lift. The gridiron, which is actually a portion of the Railway, is lowered with the cradle upon it and immersed in the water to the bottom of the dock.

The vessel which it is proposed to transport will then be guided to and floated exactly over the cradle—the keel and bottom of the vessel corresponding with the line of blocks and cushions previously arranged to receive her. The arrangement of the blocks and cushions will vary according to the lines of the various crafts to be transported. Once in the proper position the gridiron will be raised to the level of the keel, and then the blocks will be hauled in while under water, close to the vessels bilges and sides. A rack with palls at the back of the blocks prevents any movement. The operation of raising the whole mass then begins by means of the hydraulic presses ranged on both sides of the gridiron.

The length of stroke is forty-two feet in each lift. The engines and presses are calculated to raise the average sized vessel, with cargo, to the level of the railway in the space of ten minutes. When the lifting process is finished the rails on the gridiron will correspond in level and coincide in line with the railway track on *terra firma*, the gridiron will then be locked securely to this level, so that by means of an accumulator and another hydraulic apparatus the cradle and ship together may then be hauled off the lift and thus transferred to the Railway, where they will be ready for transportation by means of locomotives.

The principle is simply a combination of the hydraulic ship lift with a marine slip or railway extended, either of which may be seen in this country in daily operation.

The operation of lifting vessels with cargo of much greater registered tonnage than contemplated here has been most successfully performed at the Malta Hydraulic Dock for many years without the slightest failure, although that dock was not specially designed for lifting loaded vessels as these will be on the Ship Railway.

The work of hauling will be done by locomotives especially constructed for the purpose instead of by stationary engines as on a marine slip, thus doing away with costly stationary engines, ropes and gearing, besides performing the service in a much quicker time.

Two locomotives will haul the largest vessel to be transported (not to exceed 2,000 tons weight) at the rate of ten miles an hour, or at greater speed, if necessary, for smaller class vessels.

The locomotives and cradles will be supplied with powerful brakes and appliances for both stopping and starting the load whenever required.

When the vessel and cradle have arrived at the other end of the Railway, the locomotive will be passed into a siding, and the vessel and cradle will be pulled on to the other hydraulic lift in the same manner and by the same appliance that they were first hauled on to the Railway. They will then be lowered and deposited into the water; and as the gridiron sinks into the bottom of the dock, the vessel floats herself off and may then be pulled into the dock, or if a steamer may steam away to her destination.

The empty cradle is then again raised to the level of the Railway, rolled on to a traverser platform where it will be shunted to one side, thus leaving the line clear for a succeeding vessel to undergo the same operation.

It will thus be seen that the whole operation is simple, rapid, and economical, scarcely any expense besides that of the lifting, hauling, and depositing being necessary.

The weight of the vessel and cargo as shewn by her displacement is not to exceed, according to the Government requirement, 2,000 tons dead weight, or a vessel of 1,000

tons gross register laden.

The line of Railway itself will be of the most substantial character. It has already been set out and levelled, and the woods cleared. The most ample borings have been taken and test pits dug to test the nature of the foundations and the quality of the material. The result has shewn a bed of rock extending over the entire distance.

There will be four lines of steel rails of 110 lbs. weight per lineal yard. The cradle for the largest vessel will be supported on bogie trucks so that the weight, evenly distributed, would not exceed 10 tons on each wheel. To provide for any unequal distribution the wheels and axles will be designed to bear more than double that weight.

"The London and South Western express engines have 9 tons on a wheel, and the rails weigh 82 lbs. per yard. The Great Northern engines have about the same weight on their express heaviest loaded wheels. On the Great Northern the armour plated trucks have 8.4 tons on a wheel, and the latter are spread 5 feet 6 inches apart, therefore load equals 3 tons per foot of line. Their heaviest tank engines weigh 55 tons on 12 feet 10 inches base, and the equivalent load is also 3 tons per foot as the wheels are spread 4 feet 9 inches apart. The Great Northern rail is 82 lbs. The above loads traverse at high speed not occurring on ship railways, so heavier loads might be put on that rail."—*B. Baker, M. Inst. C. E.*

The distributed weight of ship and cradle on the sleeper bed area will compare favorably with that of a train of the heaviest locomotives in America, whilst the rail is nearly twice as heavy, and sleepers much stronger.

STATUTES OF CANADA.—49 VIC. CAP. 18.

An Act to amend the Act to provide for the granting of a subsidy to the Chignecto Marine Transport Railway Company (Limited).

Assented to Wednesday, 2nd June, 1886.

HER MAJESTY, by and with the advice and consent of the Senate and House of Commons of Canada, enacts as follows:—

1. The term during which a subsidy may be granted out of the Consolidated Revenue Fund of Canada to the Chignecto Marine Transport Railway Company (Limited), under the provisions of the Act forty-fifth Victoria, chapter fifty-five, shall be twenty years instead of twenty-five years, and the amount of the subsidy that may be so granted shall be one hundred and seventy thousand six hundred and two dollars a year, instead of one hundred and fifty thousand dollars a year.

2. The Company shall only call on the Government of Canada for the payment of such sums of the subsidy payable as above mentioned (which shall not in any case exceed the amount then due and payable), as may be required to make up the net earnings of the undertaking to seven per cent. per annum on the authorized share and bond capital of the Company, namely, five millions of dollars.

3. In case the earnings of the undertaking should exceed seven per cent. per annum upon the aforementioned capital, the Company shall pay over to the Government of Canada, one-half of the surplus profit beyond the said seven per cent., until the whole of the subsidy which may then have been paid to the Company shall have been repaid to the Government by the Company.

"4. The Indenture made on the fourth day of March, in the year of Our Lord one thousand eight hundred and eighty-six, between *The Chignecto Marine Transport Railway Company (Limited)*, and Her Majesty the Queen, represented therein by the Minister of Railways and Canals of Canada, a copy of which is in the Schedule annexed to this Bill, is hereby approved and ratified."



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