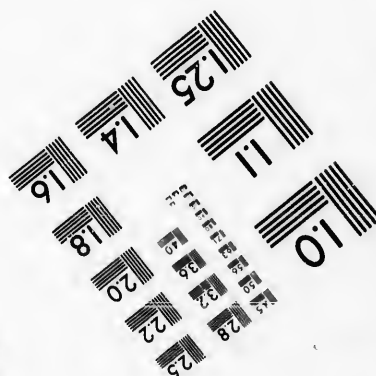
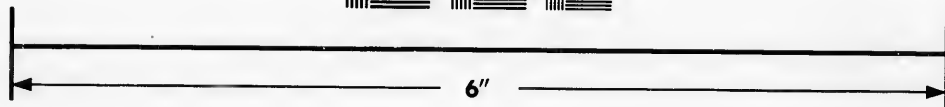
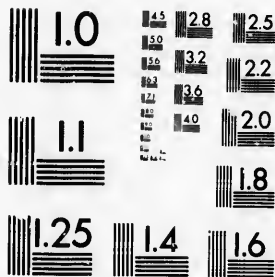


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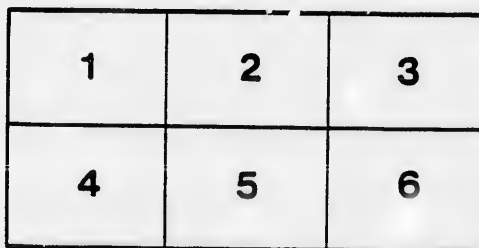
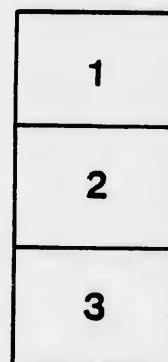
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REPORT

ON THE

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1885

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MONTREAL NORTHERN COLONIZATION RAILWAY.

REPORT

ON

HOCHELAGA AND ST. JEROME SECTION,

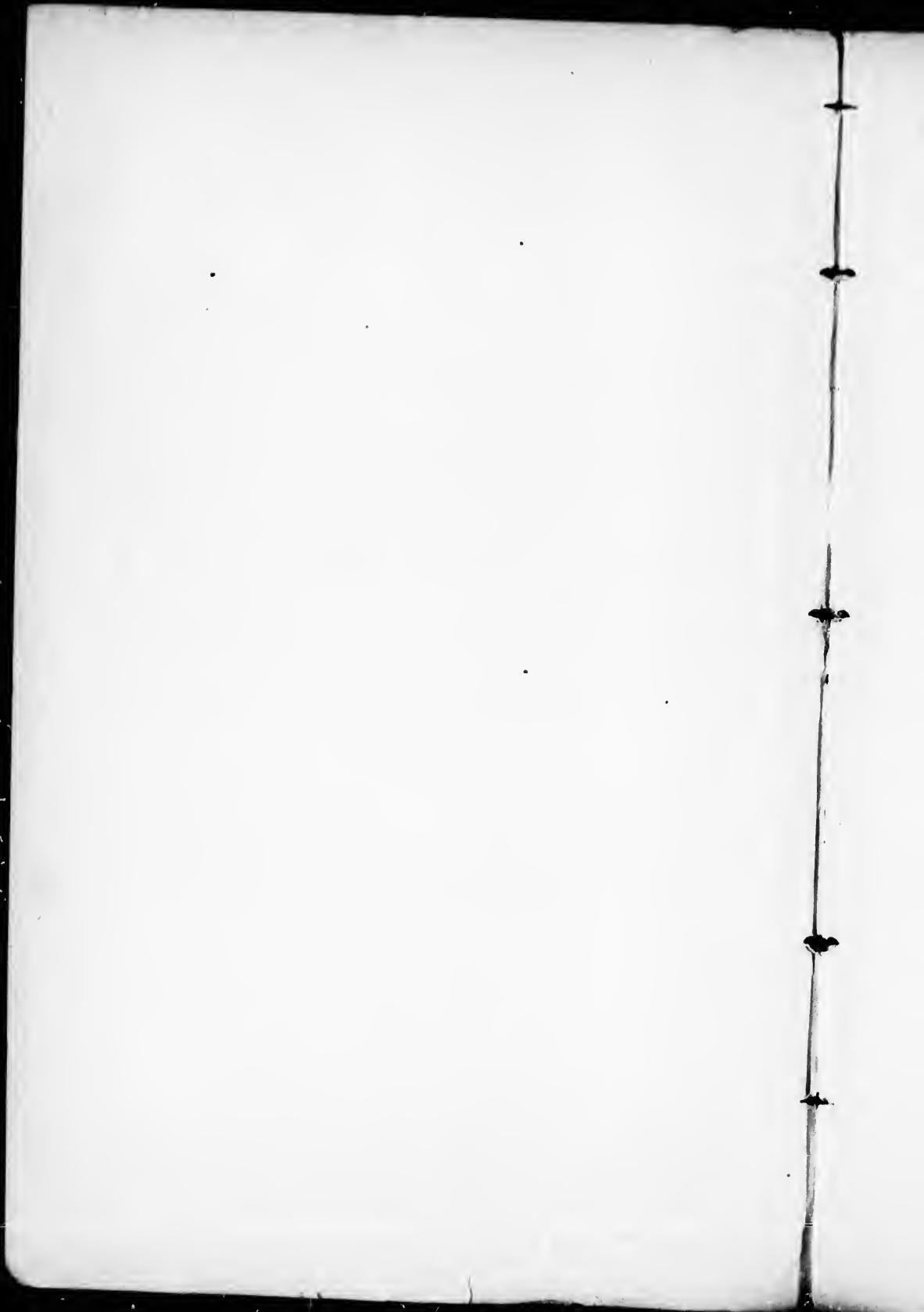
BY

CHARLES LEGGE,
Civil Engineer.

Montreal :

HERALD STEAM PRESS, 51 AND 53 ST. JAMES STREET,

1869.



REPORT.

MONTREAL, 16TH SEPTEMBER, 1869.

48 GREAT ST. JAMES STREET.

To the Provisional Directors of the Montreal Northern Colonization Railway Company.

GENTLEMEN,—

Having been requested by you to assume the duty of conducting the preliminary surveys of the proposed Wooden Railway from Montreal to the districts lying north of the city, and report the most approved route for adoption, together with the cost of construction, I have now the honour to inform you that those instructions have been complied with. The conclusions arrived at will be embodied in the following report, and illustrated by the accompanying plans, sections and detailed estimates herewith submitted for your consideration.

Prior to entering upon a detailed description of the various results attained by the instrumental surveys, it may be well to glance at the earlier steps taken with the view of opening up the back country to settlement, and facilitating communication between its various districts and this city, as explanatory to a certain extent of the course which has since been followed.

For several years past, considerable attention has been directed to the important question of colonizing our wild lands, by adopting means for bringing them into the market on liberal terms, and under such conditions of access by means of colonization roads, &c., as would encourage both the immigrant and native, to acquire and take possession of the same, and in this manner add to the growth and prosperity of the entire country.

The success which has recently been met in the State of New York, in the construction and operation of cheap wooden railways, in localities where the more expensive iron road was impracticable by reason of its greater cost, created a desire to take advantage of the same means of traffic in the Province of Quebec, for the purposes to which reference has been made.

In order to adopt means for carrying this system into effect from Montreal northward, a meeting was convened in this city in the early part of last winter, of gentlemen interested not only in the development of the country in the rear, but also in the prosperity of Montreal; both of which would be largely augmented by the construction of a cheap line of railway connecting the two.

At this meeting various routes were suggested and advocated, but without any definite one being selected—a committee was however appointed to visit the back districts, and make themselves familiar with their resources, &c., to enable a decision to be arrived at, as to the most favourable line for complying with the following general conditions.

1st. For supplying the city with cord wood at a reduced rate.

2nd. For affording a better mode of colonizing that at present nearly uninhabited portion of the Province of Quebec by the increased facilities of travel and transport which would thus be created.

3rd. The route which would give the greatest enhanced value to the public domain as well as to private property, not only in the country to be traversed by the road, but also extending to a considerable distance on each side of the line, in bringing its products into easy connection with the Montreal markets; also, in the advantages which this connection would bestow on the city itself by the traffic thus created; and in the selection of the most suitable site for a terminal station at or in the city, for the facile distribution of the wood, lumber and other freight from the back country.

On the 17th of December last, the report of the committee was received, and afterwards presented at a public meeting on the 12th January following.

The terminal point at Montreal for the proposed railway was provisionally located at Mile End, a site which presented peculiar facilities for the accumulation of large quantities of cord wood, on account of the comparative cheapness of land and convenient means of access by several streets into the heart and suburbs of the city. By reference

to a map, Montreal will be seen to be of an oblong form, being about three miles in length by one mile and a half in depth.—If the terminus were located at the western end, the length of line to reach that point would be greater, and at the same time pass over a more difficult route. The most available site is now used by the Grand Trunk Railway stations, and occupied to the utmost extent. There would consequently be no room for additional railway accommodation, still less for the accumulation of large quantities of cord wood, but even did this difficulty not exist, there would still remain the want of street accommodation for the greatly increased traffic from the wood yard, to say nothing of the greater average haul for general distribution by carts along the major axis of the city. At this point also, it would not be practicable to connect the line of railway with the harbour, a feat yet unaccomplished by the Grand Trunk Railway, but which for the accommodation of the lumber trade of the interior, must yet form an important element in the successful working of this projected road, to say nothing of its future connection with the proposed north shore line from Quebec, and also with the American railway soon destined to tap the St. Lawrence at or near Longueuil.

The terminal station at Hochelaga, or the eastern end of Montreal, will fulfil a greater number of conditions required, especially with reference to the lumber interests and connection with the future lines of railway to the east and south. The cord wood trade with the city, as well as the ordinary traffic, will also be served at Mile End, or at a point on the city's boundary about half way of its greatest length—from this point, the wood and other traffic can be brought into the city on the line of its minor axis by several convenient streets, and distributed to the right and left over its area.

With Mile End as a wood and traffic station, provided with suitable siding accommodation, and the main line carried *via* Bulmer and Shepperd's brick fields direct to Hochelaga, all the various advantages to be reaped from the successful carrying out of the enterprise will be realized.

Having therefore decided on Hochelaga and Mile End, as the points of departure from the city, the committee after having visited and examined the various points to the north, with claims on their attention, finally selected St. Jerome, a flourishing village situated on the North River, about twenty-seven miles in a north westerly direction from Montreal as the other terminal point, at the present time. At this place the existing price of fire wood is but one dollar per cord, while in Montreal, at the other end of the twenty-seven mile line, the price ranges from six to seven dollars per cord—an ample margin for profit to the producer, freight and profit to the railway company, with reduction to the consumer.

From this point, extensions can be made westerly to Lachute and Grenville, to connect with the Canada Central Road; or, easterly to New Glasgow and other important points, tapping all the trade flowing down from the parishes in the rear. A leading advantage possessed by St. Jerome is the opportunity of extension northward through the Laurentian range of Mountains, by following the course of the North River, and in this manner reaching the unoccupied lands in the rear; also, drawing traffic from the fertile lands bordering on the River Rouge; in fact, forming the most direct outlet for that important agricultural, mineral and lumber country to the city of Montreal. Through information derived from responsible parties, the committee is led to believe that by the construction of a lock at an expense of about \$5,000, the North River would be rendered navigable for a distance of at least six leagues above St. Jerome. This being the case, the river at a cost of about one mile of railway, would become a practical extension of the road to a further distance of eighteen miles, and thus act as an efficient feeder.

This gorge through the mountains made by the river in question, is also the most convenient outlet for some 18,000 people residing in the rear parishes, and who, no doubt, would give the road considerable traffic on mutually advantageous terms.

St. Jerome while situated in the midst of a fine agricultural country, also possesses an almost unlimited water power, to which special reference will be made in an after part of this report. A line drawn from the village to the centre of the city, divides the country equally between the Ottawa navigation on the west, and the Rawdon and Industry line of railway on the east, thereby equalizing the advantages to the lateral traffic created on both sides.

Considerations like the foregoing almost irresistibly compelled the adoption of St. Jerome for the present northern terminus of the road. The attention of the committee was next directed to the examination of several routes available for uniting the two extreme points which will be briefly glanced at.

The first from Hochelaga *via* Mile End, Sault aux Recoillets, Village St. Rose, St. Therese to St. Jerome, a distance of about 30.85 miles. The second from Hochelaga *via* Mile End, Vinet's Bridge, St. Rose and St. Therese to St. Jerome, a total distance of 30.43 miles, while a third line was suggested from Hochelaga *via* Mile End, Vinet's Bridge, St. Martin, Moulin à la Dalle, St. Therese and St. Jerome, a distance of 34.04 miles, each of which claimed special advantages over the rival routes. These diverse claims being only

susceptible of adjustment by instrumental examination, the committee concluded their report as follows:—

1st. That application be made for a charter to construct the Montreal Northern Colonization Railway, leading from the city of Montreal by the most direct and cheapest route to St. Jerome, and continued thence in a northerly direction with power to build branch lines from the main trunk road to connect with St. Eustache, Terrebonne and other villages lying to the east and west of it, as circumstances may warrant.

2nd. That the government of the Province of Quebec be applied to for a grant of 500,000 acres of unceded lands at the nearest points to the road, to aid the company in the prosecution of the enterprise.

3rd. That either the general government or the local government be applied to for assistance, in the construction of the railway bridges over the two branches of the Ottawa.

4th. That the corporation of the city of Montreal be applied to for assistance, either by taking stock in the enterprise, or by a grant of money.

5th. That the stock books be opened at as early a date as possible in the city of Montreal, and at different points along the line.

The above recommendations having been embodied in the form of resolutions, were passed unanimously by the meeting, and steps at once taken to obtain a charter and the required aid from the government, both in grants of land and money.

On application to the local government at Quebec, the promoters of the enterprise were met with the assurance that while the government was willing to give all the assistance in its power towards the carrying out of this and similar roads in other parts of the country, yet it was not prepared to make a grant of land in accordance with the prayer of the second resolution, but in place would be willing to give a money grant, in the form of a subsidy, at the rate of three per cent on five thousand dollars a mile; and in addition to which, any bridges exceeding a cost of \$5,000, would receive three per cent on the established *bona fide* cost of the same.

A bill to this effect was introduced, passed and assented to on the 5th April, 1869. An Act incorporating the Montreal Northern Colonization Railway Company, was also assented to at the same time, and amongst other privileges, grants the power to extend from the main line, branch roads to St. Eustache, St. Scholastique, Laehute, Grenville; or to unite with the Carillon and Grenville railway, or to extend the line beyond the District of Terrebonne towards the city of Ottawa, so as to unite with such other railways as may hereafter be built by the "Canada Central Railway Company." Power is also given to extend branch roads as far north as St. Sauveur, St. Adele, St. Agache, and easterly through the township of Kilkenny, to unite with the Lanoraie and Rawdon railway. The company has also the special power of *buying*, transporting and *selling* fire wood. The capital stock being \$500,000 in fifty thousand shares of \$10 each, with power to increase the capital stock to \$2,000,000.

The foregoing sketch will serve to give a brief history of the enterprise up to the month of June last, at which time I received instructions to survey the several lines to enable a selection of route to be made; it also covers ground and gives general explanations on several points, especially with reference to the termini of the line, to which it will not again be necessary to refer.

To carry on the survey I selected Mr. Leclair, Provincial Land Surveyor, of St. Therese, and Mr. Malsburg, Civil Engineer of this city, two gentlemen well qualified for the duty from their acquaintance with the country. The results arrived at will now be laid before you. That portion of the route between Hochelaga and Mile End, amounting to 2.71 miles, being uniformly agreed on, and therefore common to whichever line is adopted, it will not be necessary on each occasion to travel over or refer to it, we will therefore for the sake of brevity, confine our description to the balance of each route, from Mile End, the point where the divergence of opinion commences.

Route No. 1.—From Mile End *via* Village of Sault aux Recollets, St. Rose and St. Therese to St. Jerome.

Commencing at a point about one thousand feet to the east of Mile End corner, the line follows the course of the farm or boundary lines to the rear of the lots, thence curving easterly, it passes to the property owned by Mr. Pelletier, and following the western side line, strikes the first branch of the Ottawa a short distance above Piché's Mills—crossing the Mill Pond, Piché's Island, and the main channel of the river, it curves to the west and proceeds in a pretty direct course to St. Rose, where it strikes the north branch of the Ottawa at a point one thousand feet above the present bridge. At this place the river is divided by islands into seven distinct channels, and as the islands occupy a considerable space between the two shores, it was thought on that account to be a favourable site for crossing. From the north shore the line runs in a direct course to St. Therese, passing to the east of the College, and so on past the Village of St. Janvier to the Trecurrie, on line between Labelle and Touchet; thence curving to the east it

reaches Cote St. Marguerite, on line between Doré and Fillion, and from thence in a nearly direct line to St. Jerome.

The total distance between the two extreme points of this route is 28.14 miles, or 9.97 miles in excess of an air line.

The length of straight line is 21.83 miles; the balance, 6.31 miles, consisting of curved line, ranging from 1° , (5,730 feet radius), to 4° , (1,433 feet radius), with a total curvature of 560° .

The estimated cost, including bridges, rolling stock, and other equipments, is \$609,609, or \$21,663 per mile. The grades descending on both sides to the first branch of the Ottawa, at Sault aux Recollets Village, are very heavy, being 90 and 105 feet per mile, respectively, while the rail level is carried 47 feet above the surface of the water in the river. The work on the north side consists of rock cutting to the extent of about 30,000 cubic yards, while on the south, or Montreal side, an embankment of some 40,000 cubic yards is required, carrying the rail at a height of 35 feet above the crossing of the macadamized road.

The length of bridge at this point is 1,218 lineal feet, of which 712 feet span the main channel, of the extreme depth of thirty feet, with a rapid current.

The crossing of the Riviere des Milles Isles, at St. Rose, is also attended with great expense. The total length of bridge to span the seven channels, formed by the intervening islands, is 2,370 lineal feet, carrying the rail at a height of 32 feet above the level of the water—the grade rising from the St. Rose end of the bridge, in the direction of Montreal, is 56 feet per mile, with a total embankment of 93,000 cubic yards. The next point where considerable expense is met with on this line, is at St. Therese where a cutting of 88,000 cubic yards is encountered. This hill, however, is of sand and gravel, and in addition to the amount required for the adjoining embankments, is favourably situated (being about midway in length of the line) for furnishing the material for ballasting the road. From St. Therese to St. Jerome the course is nearly direct, and the country being level, requires but little work beyond grading.

Route No. 2—From Mile End, via Vinet's Bridge, St. Rose, St. Therese, to St. Jerome.

This line leaves the first line at a point about two miles from Mile End, and proceeds in a direct course to Vinet's Bridge, crossing the river either on the upper or lower side of that bridge, and from thence continues in a direct line to intersect with Route No. 1 on Isle Jesus, at the school house on the farm owned by Martin Lavoie, bordering on the road leading to St. Martin; afterwards following Route No. 1 to St. Rose, St. Therese and St. Jerome.

The length of this line is 27.72 miles, or 0.55 miles in excess of an air line. Of the total length, 23.56 miles are straight, and the balance of 4.16 miles made up of curved line, ranging from 1° (5,730 feet radius) to 4° (1,433 feet radius.) The total curvature is 318° , and will cost \$522,298, including bridges, equipment, &c., or \$18,844 per mile.

This route, while taking advantage of the improved site for crossing the Back River at Vinet's Bridge, still labours under the disadvantage of the St. Rose crossing.

Route No. 3—From Mile End, via Vinet's Bridge, St. Martin, Moulin à la Dalle, St. Therese, to St. Jerome.

This line, leaving Mile End, follows portions of the first and second routes to Vinet's Bridge, crossing the river either above or below that bridge, and curves westerly, running in a direct line to St. Martin; thence curving in a northerly direction, it proceeds to Moulin à la Dalle, crossing the three channels formed by the islands in the river at that place, it thence runs for a distance of three miles, when it curves to the east and intersects the first route near the Cote St. Louis Road, a short distance to the north of St. Therese, thence following the original route to St. Jerome.

This line could be somewhat shortened by striking direct from Moulin à la Dalle to St. Jerome; but, by so doing, it would leave the important village of St. Therese some distance to the east, and probably the ballast hill before referred to. Additional surveys would be required to determine these points with precision. The distance from Mile End to St. Jerome, by this route, is 31.33 miles, or 4.16 miles in excess of the air line. Of this distance, 26.60 miles are straight, and the balance of 4.73 miles made up of curved line, ranging from 1° (5,730 feet radius) to $3^\circ 30'$ (1,637 feet radius); the total curvature being 450° ; and cost, including bridges, equipments, &c., \$444,654, or \$14,224 per mile.

The most noticeable feature in the construction of this line is the reduction in cost of the bridges over the two rivers or branches of the Ottawa, as well as the more favourable gradients obtained at those places. Two sites for crossing the Back River, at or near Vinet's Bridge, may be briefly indicated:—

1st. The piers of the present bridge extend fifty feet above the line of the bridge, and are shielded by large wooden ice breakers, extending still further up. These piers are wooden cribs, filled with stones, and are in a dilapidated condition from the surface of the water up. They would require widening and rebuilding for the reception of the stone piers to support the superstructure, the present ice breakers protecting them

against the ice and timber rafts. The total length of super-structure will be 952 lineal feet. A second plan, open to adoption in case arrangements cannot be made with the proprietors of the bridge, will be to extend the piers on the lower side of the bridge, and cross at that point, being at the same time protected from the ice and rafts of timber by the bridge piers and ice breakers above. The same length of super-structure will be had, at an increased cost of \$3,800, in consequence of the additional crib work required. The rail will pass through the bridge, in place of over its top at a height of 27 feet above low water, and is approached by very easy gradients.

The bridge crossing the Riviere des Milles Isles, at Moulin à la Dalle, passes over three channels, with a total length of superstructure of 1,020 feet, carrying the track through it at a height of 17 feet above low water. The contour of the country on each side of the river, is extremely favourable for gradients in approaching the bridge, and in this respect is far in advance of the St. Rose crossing.

From Moulin à la Dalle to St. Therese the line passes over a comparatively level country, and from that village to St. Jerome follows route No. 1.

The following table will present at a glance the salient points of each route, and give facilities for determining the respective merits of each :

ROUTES.	Total length	Total cost.	Cost per mile complete.	Length of straight line	Length of curved	Total amount of curvature.	Total length of bridges.
	Miles.			Miles.	Miles.	Degrees.	Feet.
No. 1.....	28.14	\$409,609	\$21,663	21.83	6.31	563	3598
No. 2.....	27.72	522,298	18,844	23.56	4.16	318	3322
No. 3.....	31.33	444,624	14,224	26.60	4.73	450	1972

When the railway to St. Jerome was first mooted, and during the course of our cursory examination of the country, I was strongly of opinion that the village of Sault au Recollet should be one of the leading points to be touched, on account of the water power at present employed at that place, and the greatly increased amount which could be brought into operation at a comparatively small outlay, the judicious employment of which would create a considerable amount of business for the Railway. This circumstance, together with the fact that one of the most energetic promoters of the enterprise, Mr. Pelletier, resided there, and who offered the right of way through his extensive property, led me to view the route with great favour. A glance at the above table, shewing this line to cost \$165,000 more than one of the competing lines, with 113 degrees of curvature additional; also, with the objectionable gradients at the two bridges, although over three miles less in length, compels me most reluctantly to abandon the idea of recommending it for your adoption.

The loss to the proprietors and manufacturers at this point, in consequence of losing the station, will not, however, be so great as at first sight may appear—at the crossing of the road near Mr. Pelletier's property, the rail level is 35 feet above the surface of the ground. The station, if placed where the level of the rail strikes the ground, would be at least 1,700 feet south of the travelled road, or of the village; a distance which would have to be passed over by an unfavourable road—whereas, on the other hand, with the station at Lajeunesse's corner, near Vernet's Bridge, the clearance from the Sault aux Recollet Village, although increased to 6,000 feet, passes over a level macadamized road, already built, and along which the products of the manufactories can easily be transported.

Route No. 2, via Vernet's Bridge and St. Rose, had also recommended itself strongly to my attention, in consequence of its directness being only a little more than half a mile in excess of an air line, with 245 degrees less curvature, than its neighbour, via Sault aux Recollet village, and a saving in cost of \$87,000. The expensive crossing, with heavy grade at St. Rose, which mainly contributes to swell the cost of this line over the Moulin à la Dalle or No. 3 route, to the extent of \$78,000, forces me for the present to rule out this otherwise most advantageous line. I say for the present, with the information now at hand. Additional surveys should be made, for a mile or so, to the east of St. Rose, with the view of ascertaining if some more favourable crossing may not exist. If so, the general course of the line could be shifted with advantage, from a point about midway of Isle Jesus, direct to St. Therese.

In the meantime, in view of financial considerations, we are forced to adopt the longer line, via Moulin à la Dalle, but with the saving of \$78,000, in first cost. The objection to this route, is the extra 3½ miles over which the through freight will have to pass for all time, lessened to some extent, however, by the easier gradients to be traversed. On the other hand, the railway will, if passing in this direction, obtain an increased amount of traffic from the large and flourishing village of St. Eustache, and

from the other villages and populous country to the north of it, which might find its way into Montreal, over the ordinary macadamized roads, were the nearest railway station located at St. Rose or still farther east.

Having now considered the three rival routes to the north, it only remains, in so far as the location is concerned, to speak of the connection of the line with the harbour of Montreal.

The plateau on which Mile End is situated, being elevated one hundred and twenty feet above the principal part of Montreal, no direct railway connection with the heart of the city could be had, except at a cost too great to be entertained, even were it prudent to allow engines to traverse crowded thoroughfares.

It has, therefore, been thought desirable to reach the level of the harbour by an extension of the main line from near Coteau St. Louis Road, curving to the east, and passing in nearly a direct course to the division line between Shepperd's and Peel's properties, and from thence, curving slightly to the south, it strikes the river a short distance above the present Hochelaga wharf.

The length of line from its point of departure, at Mile End, to the harbour of Montreal is 2.71 miles, of which 1.38 mile is straight, and the balance of 1.33 mile in curves, ranging from 1° (5730 feet radius,) to 3°, or (1,910 feet radius.) The total cost of this section will be about \$45,000, or \$16,605 per mile, without taking into account its proportion of rolling stock or equipment. The wharf, it is presumed, would be constructed by the Harbour Commissioners, the company doing the filling, with the excavations from the line.

The heavy work on this section comprises the cutting and embankment required on the properties of Messrs. Gale, Peel, Shepperd and others, for grading down to the lower level; also, the cutting near the harbour to reach its level—the line at that point passing underneath the Hochelaga and Long Point Road, and coming out on to the wharves either at right angles with the harbour, or curving and running parallel to it.

With reference to the necessity of making this short extension of the line, I may be permitted to express an opinion strongly in favour of its immediate construction, when the company will at once find a large traffic in lumber for exportation, either by water or by the line of railway projected from Longueuil to unite with the American lines on the south. This trade is soon designed to be largely increased by the junction of our line with the Canada Central Road from the great lumber producing region of the Dominion. In the meantime, the Hochelaga extension is urgently required for supplying cord wood to the extensive brick and lime kilns, and to a large portion of the eastern suburbs of the city, receiving in return a considerable amount of freight, in the form of bricks, lime, &c.

Before taking leave of the comparative estimates of the cost of construction, it may be well to state that the bridges are designed on the "Howe Truss and Arcu" principle—the foundations of abutments and piers, up to the surface of low water, being crib work filled with stones; from that level to the under side of the super-structure, masonry is employed. The timber work of the bridges is rooted, and entirely covered in by boarding, or sheeting, to prevent decay. The embankments are made twelve feet wide on top, with slopes of 1½ to 1, and cuttings, fifteen feet wide, with similar slopes.

The average width of land taken is 80 feet, sufficient for a double track at a future period. Culverts, both beam and box, are all of stone. The ballast is one and a half foot in thickness, and eleven feet in average width. The gauge adopted is the narrow one, or four feet, eight and one half inches. The wooden permanent way recommended, and which will be presently described, is that known as the "Foster wooden Railway." An estimate of the cost of the equipment, such as rolling stock, station buildings, freight engine, and car shed, machine and repairing shops, &c., &c., will be found annexed, and reaches the sum of \$110,000, which has been embraced in the foregoing estimates, or \$3231 per mile, from Hochelaga to St. Jerome *via* Moulin à la Dalle. It may be stated, although this estimate looks large, for so short a line, that one double the length, would cost but little more. The same rolling stock, engine and repair, shops, &c., &c., being adequate for the increased service.

The style of engine, strongly recommended for a road of this character, is the "Fairlie Eaton Engine." It is a "double header," with the tender placed in the centre, and by its peculiar construction is capable of passing much sharper curves, surmounting steeper gradients, with heavier loads, than any other engine now in use, while, at the same time, it is much easier on the permanent way, (in this case peculiarly necessary) and does not require a turn-table. This style of locomotive engine, although new, has been tested, and found to possess all the foregoing characteristics.

It may be asked, why go to the expense of masonry, piers, and abutments for the bridges and culverts, of a wooden railway? Why not also adopt a cheaper style of structure up to sub-grade? In reply to this, it may be stated that truss bridges of the description required for those localities, are carefully protected from the weather, to insure the maximum longevity. They are also so arranged, that different parts may be

replaced from time to time, as decay sets in, and the whole structure, in this manner, kept in good health. With the abutments and piers, however, if built of perishable material, say above the surface of the water, it is almost impossible to replace the decayed parts, or to protect them efficiently. In a few years, therefore, this most important part, on which the stability of the whole depends, becomes insecure, and the destruction of the bridge quickly follows. With the ordinary beam and box culverts along the line, the parts could be replaced without trouble, but the amount saved in this way, by substituting wood, would be inconsiderable.

I have, notwithstanding, prepared an estimate of the three lines on the supposition that all the mechanical structures are built, in the first instance, of wood, and now beg to submit it in the following table, from which you will see at a glance the relative saving in first cost over the more durable stone structure:—

ROUTES.	Total cost of line with bridge piers, &c., built of masonry.	Total cost of line with bridge piers, &c., built of wood.	Saving effected.
No. 1—Hochelega to St. Jerome <i>via</i> Sault aux Recollets, &c.	\$54,609	\$594,250	\$60,359
No. 2—Do. do. <i>via</i> Vinet's Bridge and St. Rose....	\$567,298	\$508,699	\$58,599
No. 3—Do. do. <i>via</i> Moulin à la Dalle.....	\$189,654	\$164,192	\$25,062

The following tables will give the relative cost of each line under the following conditions:—

1st.—BRIDGES AND CULVERTS, WITH STONE ABUTMENTS, PIERS, &c.

ROUTES.	Total cost of the line, per mile, complete.	Total cost of the line, per mile, without equipment.	Total cost of the line, per mile, without equipment or bridges.
No. 1—Hochelega to St. Jerome <i>via</i> Sault aux Recollets Village and St. Rose—30.85 miles....	\$21,219	\$17,653	\$10,942
No. 2—Do. do. <i>via</i> Vinet's Bridge and St. Rose—30.43 miles.....	\$18,642	\$15,027	\$8,954
No. 3—Do. do. <i>via</i> Moulin à la Dalle and St. Therese—34.04 miles.....	\$14,584	\$11,153	\$8,008

2nd.—BRIDGES AND CULVERTS BUILT ENTIRELY OF WOOD.

ROUTES.	Total cost of the line, per mile, complete.	Total cost of the line, per mile, without equipment.	Total cost of the line, per mile, without equipment or bridges.
No. 1—Hochelega to St. Jerome <i>via</i> Sault aux Recollets Village and St. Rose—30.85 miles....	\$19,262	\$15,697	\$10,588
No. 2—Do. do. <i>via</i> Vinet's Bridge and St. Rose—30.43 miles.....	\$36,717	\$13,122	\$8,595
No. 3—Do. do. <i>via</i> Vinet's Bridge and Moulin à la Dalle—34.04 miles.....	\$13,645	\$10,414	\$7,875

It is now necessary that some remarks should be made with reference to the new style of permanent way, or track proposed for the line. The report having reached a greater

length than at first intended, the description will necessarily be brief, as you are all familiar with the features of this important part of the work. It will be given more for the benefit of those who may not have seen this rather novel substitute for an iron railway, a system which will no doubt be productive of great good to the country, owing to its economic adaptation for the object in view, viz: cheap and efficient colonization roads.

For the past two years, public attention has been directed to this description of cheap railway, by reason of the success which has attended the working of a line at Clifton, in the State of New York. During the last summer, I paid this line a visit for the purpose of examining the character of the work, with mode of operation; and had the pleasure of meeting Mr. Hulbert, the Engineer, under whose directions it was built, and who kindly accompanied me on a trip along the line. The superstructure, or permanent way, consists simply of two parallel maple rails four inches by seven inches, in lengths of fourteen feet, let into notches cut in the cross-ties, and held firmly in place by two hardwood wedges, driven in opposite directions in the notches, along side of the rails. The cross-ties, or bearings for the rails, are rather more numerous than in the ordinary iron road. The bridges and other mechanical structures along the line, as well as the permanent way, give evidence of having been built for the minimum amount of money, but small attention having been paid to ballasting, levelling up, or alignment of the road, and in consequence, the maple rails gave evidence of severe usage, being "broomed up," or crushed on their upper surface to such an extent, that the work of renewal was then in active progress, though I believe, this was but the second full season the line had been in operation.

The points of greatest interest in connection with this work, are the steep gradients overcome, in some cases as much as three hundred feet to the mile, or nearly six times the rate of maximum grade on the Grand Trunk Railway; or, about three times as much as the heaviest incline on the Hochelaga and Northern railway. The sharpest curve on the Clifton road is two hundred and fifty feet radius, while the minimum curve on our line will be sixteen hundred and thirty seven feet radius. Mr. Hulbert states that the first cost of the road, irrespective of land purchase and fencing, was about \$7,500 per mile, and the rolling stock at the rate of \$4,000 per mile additional, all in American currency. By reference to the accompanying estimate, it will be seen that our line will cost \$7,264 per mile, Canada currency, including land and fences, but without the exceptional bridges over rivers; this also including a more durable and expensive permanent way, with eighteen inches of ballast throughout. The Clifton rolling stock, comprises engines and dump cars for the conveyance of iron ore, no passenger traffic being allowed. Our estimate for rolling stock, embraces 3 first-class engines, 7 passenger cars, 20 box freight cars, and 50 platform cars, with machine and repair shops, station-houses, freight sheds, engine-houses, and other necessary appliances for the efficient working of the line and amounts to but \$3,231 per mile Canada currency.

Mr. Hulbert states that the track, or permanent way on the Clifton road cost \$1,500 gold, per mile. Mr. Foster, the inventor of the new style of superstructure, will be prepared to lay it down on the road complete, ready for the rolling plant, say for engines of twenty tons, running at the rate of twenty miles per hour, at \$1,760 per mile, or one dollar per yard. Two serious objections, in my opinion, exist to the Clifton system of wooden track, and are as follow:

1st. The rails are laid longitudinally, exposing the fibre of the timber, in the weakest condition to the traction, causing it to crush or "broom up"

2nd. The joints in the rails occurring at short intervals of 12 to 14 feet, without assistance of the chairs or fish plates of the ordinary iron rail, cause an uneven surface to the road. The engines and rolling stock, in passing over the line, at each inequality, impinge on the rails to a greater extent, than if they were uniform and continuous, and thus increase the destroying agencies; while at the same time, acting prejudicially on the rolling stock itself.

These two leading objections have been surmounted in the "Foster system." It is a well known fact, that the fibre of timber, when placed endways, is capable of resisting a much greater amount of strain, or wear and tear, than if exposed horizontally to the same force; wooden steps for supporting the shafts of water wheels, being cases in point, are used in preference to metal bearings, and last for many years.

The improved arrangement for enabling the wood to perform its greatest service, will be briefly described:

Short blocks of hard wood 3½ inches thick, and 7 inches long, are placed between two longitudinal pieces of pine, each 8 inches by 4½ inches, and of convenient length. These pieces having been checked out on their inner sides, about 5 inches by 1 inch, for the reception of the blocks, which rest at their lower ends on the shoulders of the checks, with two inches bearing, and projecting three inches above the longitudinal; oak pins of 1 inch diameter, are driven through the side pieces at each joint of the blocks—the

longitudinals break joints with each other, and are secured together at those points with iron bolts. The longitudinals and blocks form the rails, and are held in guage with each other, at intervals of ten or twelve feet, by being dropped into notches cut in cross-ties, and held firmly in place by double wedges driven between the side of the notch and the longitudinal timbers, the whole being bedded firmly in the ballast, which is brought to the upper side of the longitudinals, leaving only 3 inches in length of the upper ends of the blocks exposed to view, and resembling two continuous parallel lines of rails. A short section of track on this system has been in use on the Industry and Rawdon railway as an experiment, since the commencement of the season—some two months after it was placed, the writer examined its condition, and found no appearance of wear. The superintendent of the line, now reports, that the material has undergone no change since the day it was put down.

The ordinary wear and tear of traffic having no practical effect on the material, when arranged in this form, the only point to guard against, is the natural decay of the timber. This could be very materially prevented, by giving the exposed surface a coating of coal tar, asphaltum, or other anti-septic, say the second season after the track is down, and when the timber has become thoroughly seasoned. These preparations will close up all the pores, seams or checks, and render them impervious to water; the sand and dust from the ballast, will also become incorporated with the tar or other substance, and be forced into the upper surface of the blocks, and increase the traction power. Treated in this manner, in my opinion, a wooden railway will last longer in this climate, than an iron road, and constructed for about one fourth of the expense, with the additional advantage, that the country furnishes all the material and labour in the wooden road, while in the iron one, an amount of money equal to at least three times the cost of the wooden track, is sent out of the country, simply to purchase the iron.

Having great confidence in this system of wooden track, I strongly urge its adoption for our proposed railway—a sample, full size, may be seen at Mr. Foster's office, in the St. Patrick Hall, and I would request gentlemen who may be interested in the Hochelaga and St. Jerome railway, or in other lines, to call and examine it.

After having touched pretty fully on all the points necessary for an understanding of the location and cost of the proposed railway, it becomes my duty to glance briefly at the important interests to be served by its construction and operation, both with reference to the city of Montreal, and the country in the rear.

We will first refer to the important subject of a cheap supply of cord-wood to the consumers in the city, simultaneously with an advanced price to the producer in the country.

For several years past, the price of this necessary article has ranged from six to eight dollars per cord, with an annual consumption in this city of over 162,000 cords, brought principally by water conveyance, and every succeeding year increasing both in cost and quantity.

At St. Jerome, as before stated, the present price is one dollar per cord, and at St. Sauveur, but seventy-five cents per cord. As some interest will be felt in learning the enormous quantity which will be available for many years, in this district of the Province, the following statement, furnished by a reliable authority, is given. In the county of Terrebonne, to the north of St. Jerome, there are 693,300 acres of bush, chiefly hard wood. In the county of Argenteuil, contiguous to Terrebonne, and within 20 miles of St. Jerome, there are 451,000 acres of hard wood land, together with some 21,000 acres of timber land in the Parishes of Canute and Columba. In addition to this, there is an almost endless extent of unconceded territory lying north and east of St. Jerome, which produces the usual quantity and quality of wood. For the present, it will serve the purpose to state the quantity of wood which the foregoing aggregate of 1,165,300 acres will yield. At say 40 cords to the acre, it will amount to the enormous sum of 46,612,000 cords; or capable of supplying this city, with its present consumption, for 288 years—a statement which will no doubt, give pleasure to those people who may be fearful of the total consumption in a few years, of the fuel of this country, more especially when it exists at the same time, within easy and cheap haul.

In the Townships of Wexford, Doncaster, Carrick and so on North, there is reported to be abundance of good pine timber.

At the present time, all this natural wealth of the country is useless, in fact a nuisance, or positive loss to the settler, from the additional labour it necessitates in clearing up his land, over the prairie land of the West. Without railway or water transportation to give it a money value, this heavy bulky article, cannot be profitably taken to market, a distance of twenty five or thirty miles, neither will its only product pot ashes, obtained at heavy cost and great consumption of fuel, pay for the time and expense of making and transporting over this long rough road to market—on the other hand, the high price of fire wood in the city, and ever on the increase, now renders this prime necessity, a very serious item in the cost of living, bearing especially with great

heaviness on the poorer classes; with the cheap wooden railway in operation, the whole subject is reversed, by practically bringing the points of demand and supply together, and thus more nearly equalizing the two. The new settler at once obtains a proper remuneration for the labour of felling the timber (*his first crop*) and in this manner maintains his family, during the time the clearing is in progress—soon rendering his land fit for cultivation, and self supporting. The market and money brought to his door for the wood, applies also to the agricultural products of his farm, and with ordinary industry, a few years will find him in comfortable circumstances. The railway built on the plan proposed, will tend more than any other means which can be adopted, to the rapid colonization of our wild lands, and so both keep the native population in the country, and incite immigration. Without the railway and its attendant advantages, the back woods-settler has but a life long struggle with poverty and toil, and frequently succumbs at an early age, in the hand to mouth conflict, or leaves the country in disgust, for the prairie land of the West.

Supposing the railway in operation, it would not be too much to assume that at least one half the wood required by Montreal, could be furnished by it, or say 80,000 cords per annum. The average price of wood at the point of supply would probably soon double, or reach two dollars per cord. To this add two dollars as the cost of transport and profit to the railway company, and an additional dollar for profit to the wood merchant. The total cost of the wood delivered at Mile End or Hochelaga would reach but five dollars per cord, or say one dollar fifty cents less than it now sells for in the city. By this yearly transaction in the one item, \$160,000 have been paid out to the farmers, or at least \$80,000 a year more than they now obtain, supposing they find a local market for the above quantity of wood, which they do not. The railway company has made at least \$40,000 more, in addition to the freight charges, while the citizens of Montreal have at the same time saved \$120,000, by the reduction in price.

The counties of Terrebonne and Two Mountains, according to the census of 1861, produced in wheat, oats, barley, rye, pease, potatoes, &c. &c. the large quantity of 1,828,649 bushels per annum; an amount no doubt now greatly exceeded. It is of course a difficult matter to determine how much of this produce finds its way to the Montreal markets. We may perhaps assume that one half, or 900,000 bushels will do so, and that the railway would be in a position, running centrally through the two counties, to command one half of that amount, or 450,000 bushels.

The Honourable John Young, in the course of his speech at St. Jerome, a short time since, shewed that the cost of transport of one bushel of grain from that place, to Montreal, a distance of say 30 miles, was ten cents, or about the charge of transport from Chicago to Montreal, a distance of 1,200 miles. He demonstrated, also, that with the railway in operation, the cost of transport would be reduced to two cents per bushel, putting the extra eight cents on each bushel into the pocket of the farmer; or for the 450,000 bushels supposed to be carried by the railway, \$36,000 per annum would accumulate in the country over and above the amount obtained under the present arrangement, while the Railway Company would reap for its services \$9,000. In the item of hay, for instance, a great profit to the farmer would arise by having this bulky article compressed and forwarded to market by railway.

The population of the three counties of Terrebonne, Two Mountains and Laval, traversed by this railway, according to the last census of 1861 amounted to about 48,000 souls; of course the number is now much in excess of that estimate. During the six summer months in each year, some 24,000 people pass over the bridge at St. Rose, and during the six winter months the number is largely in excess of the summer travel. But assume the total number at 48,000, or equal to the population of the three counties, and that each of the population pay an annual visit to Montreal; suppose also that at least one half of the number availed themselves of the railway, each paying twenty five cents coming and going, or fifty cents for the round trip, averaging say thirty miles; the total revenue derived by the Railway Company would be \$12,000, or probably much less than the same number now paid for bridge tolls alone.

These estimates have a large margin in their favour, and besides cover but a portion of the traffic which would be accommodated, or be brought into existence, with the facilities offered by the railway. The banks of the beautiful North river, in the neighbourhood of St. Jerome: the picturesque lakes, and glens of the Laurentides, as well as the sylvan spots of the Riviere des Milles Isles, and Riviere des Prairies, would soon be studded by villas and summer residences, with easy access to and from the city, rendered possible by the railway. Every farm, for miles on each side of the route, would be doubled in value, immediately on the passage of the first train. The water power now running to waste, would be turned to useful account in manufacturing operations, and in turn react on all other branches of industry. The rich plumbago, iron, and other mines in the Laurentian district, would at once assume a new or enhanced value, and a fresh aspect be put on the whole face of the country.

Collecting our computed annual revenue from the three items enumerated we have :

Traffic charges on transport of 80,000 cords of wood at \$1.50 per cord,	\$120,000
Do. do. 450,000 bushels of grain at 2 cents.....	9,000
Do. do. 24,000 passengers at \$0.50 ..	12,000
Making a total annual revenue of.....	\$141,000

Of which we will allow the large margin of 80 per cent. to cover working expenses and renewals, and there will remain \$28,200 for interest account.

The amount of money required to build and equip the line from Hochelega to St. Jerome is.....	\$489,654
Which at 7 per cent. per annum will require.....	\$34,275
To meet this amount, are the proceeds of the Government guarantee of 3 per cent. on \$5,000 per mile for 34.04 miles = \$170,200	
at 3 per cent.	\$5,106
Cost of bridges over Ottawa \$107,958, at 3 per cent.....	3,211
Estimated profit on traffic.....	28,200
	<u>\$36,517</u>
Leaving a balance of	\$ 2,242

After paying 7 per cent. on the total investment, and allowing 80 per cent. for working expenses and renewals.

The foregoing figures all err on the safe side, and should convince the most sceptical of the great importance of the work, both to the country and city.

Taking the saving effected to the city in the reduction in price of the single article of cord wood, and the gain to the country by the enhanced price of the same, with the increased price of agricultural products, and we have a sum of \$236,000 per annum realized by the operation of the road, a saving which in two years would more than build and equip the line.

Or, in the event of the Corporation of Montreal, and the various municipalities interested, agreeing to become responsible for the annual sum required as interest on the total cost, less the amount of the Government guarantee, \$8,317, it would only amount to \$25,958. We have shewed that the city and municipalities will each year save, on only two items of the traffic, the sum of \$236,000, from which deduct the amount of interest on cost of railway, \$25,958, for which they would be liable, and a net yearly balance of \$210,042 is in their favour.

It is considered that any further comment is unnecessary.

Before concluding the Report, a few remarks on the water power at St. Jerome may not be out of place, in consequence of the intimate relation which exists between its profitable employment, and the construction of the railway. The North River which furnishes the power in question, takes its rise in several large lakes in the interior of the country, draining a large extent of territory, and flowing in a southerly direction to St. Jerome, where it turns suddenly and runs in a south westerly direction, discharging into the Ottawa river, near St. Andrew's. At the village of St. Jerome, and for the distance of six miles there is a fall of three hundred and five feet, divided over that space by a succession of cascades or currents, and developing a power of 120,000 horses, at the lowest stage of the water in a dry season, or about twelve times as much power, as exists at the city of Lowell, in the United States.

In all my experience as an hydraulic engineer, I have never seen a more favourable locality for employing the water by a succession of dams, at different points along the river, thus causing it to repeat its useful effect, at least a dozen times, within the distance of six miles. The bed of the river in many places, is of rock, with adjoining banks admirably adapted for the efficient distribution of the power for useful purposes, in mills and factories.

Passing along the beautiful banks of this river, and stopping from time to time to examine points which would give joy to the hydraulician's heart, and which by the expenditure of a few hundred dollars could be converted into splendid mill sites; with the rich undulating agricultural country stretching off to the south, east and west, and flanked on the north by the Laurentian mountains, with their undeveloped mineral wealth, the spectator would be deeply impressed with the facilities given by Providence for turning the riches of this region into a means of support for the teeming population yet destined to occupy this favoured country. The writer himself, could well sympathize with the enthusiasm of the Reverend Mr. Labelle, the esteemed cure of the parish, who is now de

voting his untiring energy to the development and useful employment of this great motive power, for the good of his fellow countrymen. Who will not wish success to his efforts, and at the same time extend the aid necessary for the purpose, simply in the construction of the Hochelaga and St. Jerome railway, more especially when by doing so, the city of Montreal and intervening parishes, will reap so great a reward in this, as well as in other respects already alluded to in this report.

An elaborate survey of the river at this point is now in progress, and when completed the entire plan of water power will be arranged and reported on. The report, accompanied by lithographic plans, will be widely distributed through Canada, Great Britain and the United States, with the view of drawing the attention of manufacturers and capitalists to the great advantages offered for the investment and employment of capital. The success of this second enterprise depends in a great measure on the carrying out of the railway scheme as a preliminary. Without it, no outlet can be had, or adequate market obtained for the products of the power utilized.

At the present time a fractional amount of the power is usefully employed at St. Jerome, but its results are confined principally to the locality. There are now in operation two grist mills, with ten runs of stones; two saw mills, one shingle factory, one carding mill, and a cloth factory turning out two hundred yards of tweed per day. If brought within two hours of the Montreal markets, by a cheap rail connection, how soon all this would be augmented, Montreal becoming the Boston, and St. Jerome the Lowell of the Dominion.

I now, gentlemen, bring my remarks to a close. In examining the subject of terminal points and rival routes, it has been my endeavour to judge each fairly on its merits, both with reference to engineering features and cost: keeping in view at the same time as a governing consideration, the selection of the line which will yield the greatest amount of good to the largest number of people.

The figures and facts are now before you, and it is for you to decide whether the deductions drawn therefrom are reasonable or otherwise.

I have the honour to be,

Gentlemen,

Your obedient servant,

CHARLES LEGGE,
Civil Engineer,
and Provisional Director M.N.C.R.

P. S.—Since the foregoing report was written, large and influential meetings of the inhabitants of Lachute and St. Scholastique, have been held with the view of taking measures for an extension of the railway in that direction. Arrangements are now in progress for making surveys between those places and St. Jerome, or other suitable point of junction with the main line. On the completion of those surveys a report will be furnished.

A second survey is now in progress, to ascertain if any more favourable crossing of the north branch of the Ottawa may not be had, east of St. Rose, as already recommended. The result of the examination will be given in the report on the Grenville and Lachute extension. In the mean time it is thought desirable, that the report on the Montreal and St. Jerome section of the line, should be made public.

Montreal, 5th October, 1869.

C. LEGGE.

MONTREAL, 11th October, 1869.

GENTLEMEN :

Since the publication of the report on the Hochelaga and St. Jerome railway, you have been requested to furnish the public with an estimate of the probable cost of an extension of the line to Grenville, with the view of tapping the Ottawa Navigation at that point, and also of effecting a junction with the "Canada Central railway."

Until the surveys are completed, it will of course, be difficult to state the cost with any degree of precision—assuming however, that the country to be traversed, is somewhat similar to that already surveyed, the following approximate estimate may be given :

The distance from St. Jerome, *via* St. Scholastique and Lachute, to Grenville is 34 miles, and taking the cost per mile as being equal to the Hochelaga and St. Jerome line, but without the exceptional bridges, the total amount for land purchase, fencing, grading and track will be

34 miles @ \$8,200	\$278,800
Add for Additional Stations and Rolling Stock	63,000
Cost of Bridge over North River at Lachute, &c.	23,200

Total cost of extension of line from St. Jerome to Grenville—34 miles..	\$370,000
To this, add cost of line from Hochelaga to St. Jerome, including bridges, &c., 34.04 miles—say }	\$490,000

Making a total cost of

For 68.04 miles, or at the rate of \$12,639 per mile, including bridges and equipments. The foregoing approximate estimate will furnish the required information, pending the completion of the surveys and detailed estimates.

I am, gentlemen,

Your obedient servant,

CHARLES LEGGE, C. E.

To the Provisional Directors, Montreal }
Northern Colonization Railway. }

