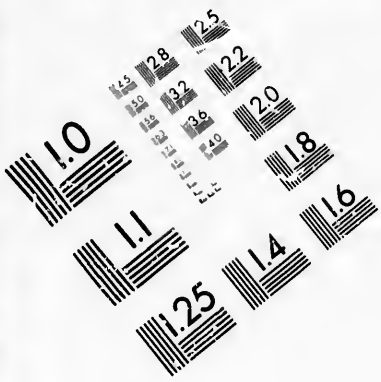

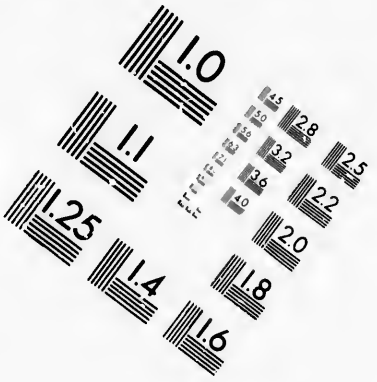

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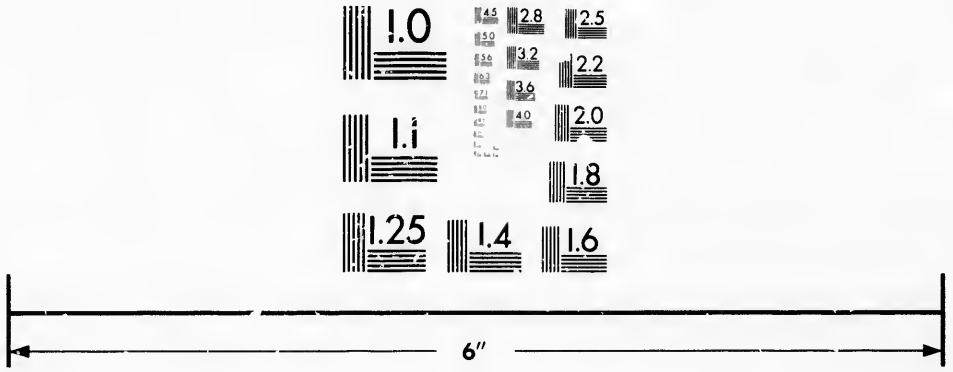

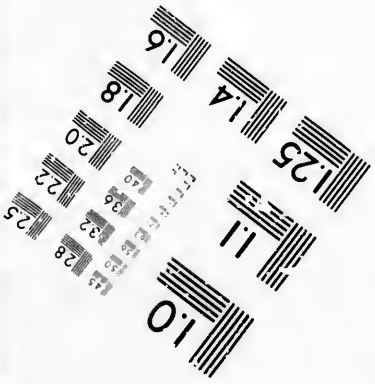

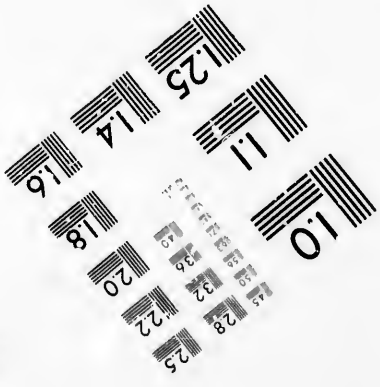

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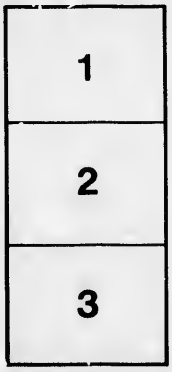

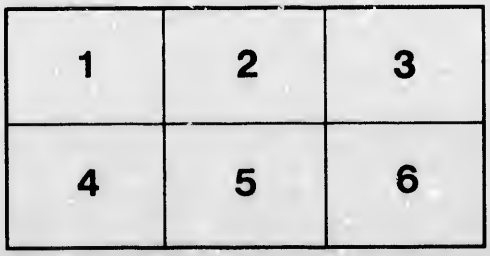

CONFIDENTIAL.

MEMORANDUM

ON THE

CANADIAN PACIFIC RAILWAY,

BY

SANDFORD FLEMING,

ENGINEER IN CHIEF.

OTTAWA:
PRINTED BY I. B. TAYLOR, 29, 31 & 33, RIDEAU STREET.

1874.

MEMORANDUM.

—:o:—

CANADIAN PACIFIC RAILWAY.

The undersigned has been requested by the Premier to submit, for the information of the Government, a Memorandum giving the views he has formed with respect to the best means to be followed in the construction of the Canadian Pacific Railway.

The attention of the undersigned was first drawn to the subject some twelve years ago, at a time when the press was agitating the public mind respecting the Hudson Bay Territory, and urging the immediate construction of a line of Railway from the then Province of Canada to British Columbia. On that occasion the undersigned drew attention to the magnitude of the projected line, the cost of establishing it, the difficulties he foresaw in maintaining it, in the then condition of the country, and he ventured to submit for consideration some observations and suggestions, having in view the establishment of the Railway on principles which would not load it with too heavy financial burdens, and which it was believed would satisfy all the demands of the country and secure a progressive settlement of the vast Territory and as rapid a development of its resources as possible. Some of the observations then made may not be wholly inapplicable at the present time.*

* To elucidate the whole subject see extracts from the article referred to, Appendix A.

Again in February, 1873, but under very different circumstances, the undersigned had occasion to give expression to the opinions which he then entertained respecting the building of the Railway. The circumstances which existed at the beginning of 1873, may be briefly alluded to :—

(1) In bringing the Pacific and Atlantic Provinces into one Political state, which took place in 1871, it was, amongst other things, agreed and determined that the Provinces on the two Oceans should be united by a Railway.

(2) The Province of Manitoba had been created, intending settlers required improved means of communication, not only to give access to the country but to afford an outlet for farm products. Hence the increased importance of the Pacific Railway, if not the immediate necessity of a considerable portion of it.

(3) The Parliament had prescribed that a continuous Railway should be constructed wholly within the limits of the Dominion, and through the instrumentality of a Company.

(4) A company had been chartered by the Government, and was about to commence negotiations with capitalists in England for the purpose of borrowing funds.

(5) Surveys had been vigorously prosecuted for two years between the valley of the Ottawa and the Pacific Coast, and a great deal of information respecting the physical features of the country had thereby been obtained.

(6) The undersigned had made a journey across the Continent through the Districts intended to be traversed

by the Railway, and thus, besides gaining detailed information from the surveys made under his directions, had the additional advantage of a personal examination of the leading features of the country.

These were the circumstances under which the undersigned drew up the Memorandum of February last year.* The object of that Memorandum was to moderate the somewhat extravagant ideas of some parties interested at that time in the Railway project, and prevent the launching of a financial scheme, which In his opinion could not fail to result most disastrously. The writer had in view the initiation of a system of construction which, while comprehensive enough to embrace the whole project and secure the completion of the Railway throughout its entire length, at as early a day as practicable, would keep down financial burdens to the minimum, prevent the waste or misapplication of funds, and to the greatest possible extent promote the settlement of the country, and thus as speedily as possible render the line self-supporting.

Circumstances have again materially changed. The Policy sanctioned by Parliament, of building the Railway through the instrumentality of a Company has not succeeded. The Company chartered to carry out the undertaking no longer exists.

The Government itself has changed and is free to adopt and recommend to Parliament any course, which, in the interests of the Dominion, may seem most advisable.

In view of present circumstances, and with the light of all the information acquired from personal reconnois-

* Appendix B.

ance, and from the surveys which have been continued under his directions, the undersigned has, as requested, given the whole subject very full consideration, and now has the honour of bringing under the notice of the Government, the following suggestions and recommendations:—

He may first, however, observe that the surveys between Manitoba and the country south of Lake Nipissing, demonstrate that through that section of country a perfectly practicable line for the Railway may be had. Between Manitoba and Lake Superior, there is indeed a choice of favourable routes, and the information now acquired, or which will be acquired before the close of the present winter, will, it is believed, be sufficient to enable the Government to decide finally respecting the location of the Railway, and to adopt such measures as may seem best with regard to the commencement of construction, when the Spring opens.

In British Columbia a great deal has been done, and a vast amount of information has been accumulated, but the field of enquiry is so exceptionally difficult that the subject is not, as yet, by any means fully understood. True, a favourable passage through the Rocky Mountains has been discovered, by which a Railway can be carried from the North Saskatchewan, to the central plateau of British Columbia, with gradients as light as those on Railways in Ontario, and with works of construction scarcely heavier than on the Intercolonial Line; we are thus enabled to project a satisfactory route from the Railway system of the Atlantic Provinces to a point within about two hundred miles of the Pacific tide water; but the great "Cascade range" of mountains intervenes and presents formidable obstacles. It must not be understood that the difficulties met with

are insuperable, but they will without any doubt prove costly to overcome. The Cascade Mountains have indeed been pierced by four lines of surveys extending from the central plateau to the coast, showing that at least two lines within the limits of practicability have been found, but the question of construction on either of these lines is one which will involve such an enormous outlay that more exhaustive Surveys should undoubtedly be made, before anything more is done. The undersigned could not advise a hasty decision. The most recent explorations we have been able to make indicate that a large expenditure, even a considerable length of time in the final completion of the Railway may be saved, by postponing a selection of the route and the commencement of construction, through the Cascade range, until more information of a definite character has been obtained, and the difficult problem more satisfactorily solved.

To render the suggestions which follow more intelligible, it should farther be explained that the main, almost the only, road capable of being used by wheeled vehicles on the mainland of British Columbia, is known as "the Waggon Road." It extends almost due north from Yale, at the head of steamboat navigation from the Gulf of Georgia, through a cleft in the Cascade range, to the central plateau above referred to, and thence to Carriboo.

A telegraph runs along "the Waggon Road" connecting Carriboo with New Westminster and Vancouver Island.

A branch to "the Waggon Road" some 50 miles in length, has recently been formed to Kamloops, at a point opposite the mouth of the North Thompson River.

It may farther be explained that a "Territorial Road," hereafter referred to, is an expression used and fully explained in the article, to which reference is first made in this memorandum.* It is employed, in the absence of a better term to express what is intended, and to distinguish this from any other kind of road: it is Intended to mean a road laid out through new Territories, with so much care and forecast, that, although in its very first stage, it may be little more than a trail or bridle path, it may eventually be developed into a Railway. A Territorial Road should be understood to mean, simply a Railway in an incipient stage, capable of being used as a means of intercourse from the first, and equally capable of being rendered more and more perfect as expenditure is progressively made thereon, until the time arrives when traffic warrants, or the exigencies of the country demand, the laying of the Rails, the furnishing of Rolling Stock, and the opening of the route as a line of steam communication.

In the case under consideration, a Territorial Road would from the first serve as a Post Road at all seasons of the year; it would afford the means of making and maintaining a telegraph line, would serve for Introducing men and supplies for building the Railway, and this being the ultimate object, the expenditure from time to time may be so regulated as to produce the desired result in the most economical manner possible.

SUGGESTIONS.

The establishment and completion as soon as practicable of a continuous Railway from Ocean to Ocean on the most eligible route, within the limits of the Dominion, should be accepted and laid down as a settled national policy.

* Appendix **A.**

It would, however, be inadvisable to push on the work of construction more rapidly than expenditure could be advantageously made.

It is considered that the most advantageous expenditure at present would be in carrying out the following services and works, all of which would form important portions of the main scheme or be auxiliary thereto.

Commencing at the Pacific Coast, the surveys to be continued vigorously in order to gain more detailed information respecting the routes through the Cascade Mountains and the approaches thereto, across the central plateau of British Columbia; the object being to enable the Government to select the route which may be found in every respect most eligible, and begin works of construction at the Coast at as early a day as possible.

From some convenient point on the Waggon Road, a Territorial Road and Telegraph to be established *via* the North Thompson River and Yellow Head Pass across the Rocky Mountains, through the whole of the wooded country to a point on the River Saskatchewan.

From the point last referred to on the Saskatchewan, a Telegraph to be built across the Prairies on or near the probable line of Railway, as far as the Southerly end of Lake Manitoba. Such portions of this distance as may require it, to be rendered available for the passage of carts or carriages by bridging the smaller streams, and establishing ferries on the large rivers In addition to this line of communication across the Prairies, the River Saskatchewan and the Lakes Winnipegosis and Manitoba, to be utilized for the purpose of intercourse and traffic by means of small Steamers, tugs, and barges, on such scale of navigation as these waters will admit of, and to

accomplish this object the Mossy portage, four miles in length, between Cedar Lake on the Main Saskatchewan and Winnipegosis Lake, and also Meadow portage between the latter Lake and Lake Manitoba, one and a half miles in length, to be improved so as to facilitate easy transfer from one water to the other. To make this line of communication as complete as possible, it would likewise be necessary to incur some expenditure in deepening the channels at Coal and Tobin's Rapids; and at other points where obstructions would be found to interfere with the navigation of the Saskatchewan at low water.

From the South end of Lake Manitoba where navigation terminates, the Railway to be at once undertaken, on the most direct and most eligible line, to the navigable waters of Lake Superior; and, as a necessary adjunct to the Railway, a Telegraph to be built so soon as the clearing away of the timber through the wooded districts would admit.

From the terminal point of the Railway on Lake Superior, a Territorial Road and a Telegraph to be established to a common point near Lake Nipissing, and from thence to diverge, one branch to the Northerly end of the Railway system terminating at Toronto, another branch on the most direct line to Ottawa and Montreal.

A few concluding remarks may be allowed. But first it may be well to form some rough estimates of the expenditure which the foregoing works would involve.

Not taking into account the Section between Lakes Superior and Manitoba, on which it is proposed the Railway should be constructed with all speed, and leaving out of consideration the cost of Surveys, still necessary to be done, more especially in British

Columbia, the maximum amount that could be judiciously expended during the year 1874, may be set down at $500,000 or $600,000. This expenditure might be somewhat increased in 1875 and 1876, and it is believed that a total sum of $2,000,000 might be expended within three years on these works, so as to result in establishing a Telegraph and Post Road along the Railway line, the whole way from the Waggon Road in British Columbia to the settlements south of Lake Nipissing.

The Railway from Lake Superior to Lake Manitoba would of course cost a large sum. The exact amount it is impossible as yet to estimate, except by the simple rule of proportion and on the assumption that one mile will cost a round sum; in this way, the cost of this Section of the Railway could scarcely be placed at less than, say—$15,000,000. Of this amount, owing to the peculiar circumstances of the case, it would scarcely be possible to spend advantageously more than $1,500,000 during the first year; however, in subsequent years, the annual expenditure might be largely increased, and it would be quite possible to lay the rails throughout in four years.

According to the above an appropriation of $2,000,000, for the year 1874, would not only be sufficient to begin operations generally, but it is probably the maximum amount, that could be judiciously expended on construction during the first season. By the end of 1874, the Surveys in British Columbia will it is believed be so complete as to enable the Government to decide on the route through the Cascade range and allow construction to be commenced from the Coast towards the interior. The progress made too during the year in other Sections

and the additional information acquired, will in another year, better than any conjectural estimate that can now be formed, guide the Government in making an appropriation for 1875.

In the suggestions above submitted, the undersigned has avoided entering too minutely into details. He may now, in conclusion, be allowed to add that the main objects aimed at are as follows, viz:—

First.—Doing everything that is possible to keep substantial good faith with the new provinces of the Dominion.

Second.—The speedy construction of that Section of the Railway, most urgently needed, to give an easy and direct means of communication between the Prairies of the Interior and Lake Superior.

Third.—Commencing the construction of the Railway at the Pacific Coast so soon as the best route through the Cascade Mountains can be determined on.

Fourth.—The immediate construction of a Telegraph and Post road along the entire length of line of proposed Railway, from the Waggon Road in British Columbia easterly, thus in two or three years connecting the road and telegraph system of Ontario and Quebec, with the road and telegraph system of British Columbia.

Fifth.—Regulating the expenditure of the above objects in the most advantageous manner and so as to substantially commence the construction of the Pacific Railway, throughout its entire length.

Sixth.—Utilizing the River Saskatchewan and adjacent waters as far as the character of the navigation will

admit and thus, as soon as that portion of the Railway between Lake Manitoba and Lake Superior is completed, providing a means of steam communication, during the Summer months, from the St. Lawrence to the base of the Rocky Mountains; from thence by the proposed Road through the Mountains, every Town and almost every Settlement in British Columbia may be reached with comparative ease, while the Railway itself was being constructed.

All these objects will no doubt at once appear sufficiently important to render comment unnecessary, except perhaps the opening of a road through some of the wildest Sections, but if it be admitted that a continuous Railway, from Province to Province is desirable and must eventually be built, if it be conceded that a telegraph, will soon be indispensible, the importance of a road, even a bridle path, will also be apparent. A road of some kind is necessary in building a telegraph and in keeping it in repair; the trees must be removed, so that they may not fall on the wires, and, with the trees removed, very little more in some cases will make a common road. The Railway when built, will require traffic to sustain it. The development of the resources of the Country is the most important, if not the only means of providing traffic, where none now exists. A road will give access to those regions now inaccessible, and who can say that when "prospectors" find their way into the rugged trackless regions, which must eventually be traversed by the Railway, they will not discover as valuable natural products, as have been found in the exposed margins of the Country? By this means it is reasonable to suppose, that the now hidden resources of the Country, might become known and developed, thus creating traffic, and paving the way for the Railway in due time.

These remarks simply point to the importance of forming a Road along the whole line of Railway instead of confining it to certain sections. The cost would be small compared with the advantages, amongst which would be the opening up of the Mineral Districts, now little known, and although the most forbidding, some of them might hereafter prove not the least valuable sections of the country as centres of industry and sources of traffic.

Another branch of the subject should be noticed, viz:—The time required for constructing and completing the work. A perusal of the papers written by the undersigned at different times, and to which reference has been made in this memorandum, will show that from the first, he has entertained very decided opinions with regard to the inexpediency of attempting to construct the Pacific Railway within too short a period. Subsequent experience and additional information acquired respecting the country, has strengthened and confirmed these opinions.

To show how difficult it is to realize calculations in these matters, when they are based on too sanguine expectations; the Intercolonial Railway may be referred to as an example.

In the year 1867, it was publicly affirmed by some of the most prominent men in the country, and by the Press, that trains would run through from Montreal to Halifax in three years; more than six years have already passed away, and the line will scarcely be completed for, at least, two years to come.

The Intercolonial Railway, certainly, might have been completed in less time than eight years, but every one admits that to have driven construction at a high rate,

in order to secure its completion by the time originally contemplated, would have completly failed, and if seriously attempted, would have had the effect of increasing the cost enormously.

If this be the experience in connection with the Intercolonial Railway, what would it be with the Pacific Line? The former is 500 miles long, while the latter is 2,500. The Intercolonial passes through a country which has been partially settled for one or two generations, it forms a direct communication between four populous cities—Montreal and Quebec at one end, Halifax and St. John at the other, and runs near the navigable waters of the open sea, throughout its entire length, rendering it easy of access for all purposes; on the other hand, the Pacific Line is accessible at extremely few points, it passes through a country, which, for hundreds of miles has not a civilized inhabitant—and the whole population now existing within a long distance of any part of its route or Terminii, may be numbered by not many thousands.

It must not however be inferred from a comparison of the circumstances which obtain on the two lines that the one work must inevitably take many times longer to construct than the other. The comparison points out the true nature of the difficulties in the case under consideration,—the sparseness of population and the inaccessible character of the country—and it indicates the double necessity of overcoming these difficulties, by some such system as herein proposed, in order to secure the Railway as speedily as possible.

However important it may be considered to have a continuous Line of Railway through the Dominion, connecting the two Oceans, the magnitude of the work and

the circumstances of the country and climate render the undertaking one of no ordinary kind, and to which ordinary rules will not apply. To prevent disappointment, it may be necessary to modify preconceived ideas; it would certainly be futile to attempt impossibilities, when the great work in hand can be accomplished in another way.

It is believed that the work could best be commenced in the manner herein suggested; the course proposed would stimulate immigration and assist settlement; as population poured in the progress of construction could be accellerated,—thus, and thus only, could the Railway be *most* satisfactorily completed throughout its whole extent, "without intermission and with all practicable speed."

The foregoing remarks are respectively submitted for consideration, in the hope that they may prove useful to the Government in connection with this gigantic and most important undertaking. The suggested appropriation for initiating construction during the present year is as liberal as circumstances would appear to warrant, it would, expended in the manner contemplated, practically and substantially commence the Railway in every Section, it would promote settlement generally and materially aid in the early developement of the mineral and other resources of the country, even in quarters which are now entirely inaccessible. By the end of another year, the best route to the Coast in British Columbia would be determined, fresh information and experience would be gained. and the Government would be in a position to decide respecting future appropriations, the mode of expenditure, and the system of construction which would appear most advisable in order to secure the completion of the Railway at the earliest practicable moment.

SANDFORD FLEMING.

OTTAWA, January 1st, 1874.

APPENDIX A

EXPLANATION.

The following article (Appendix A.) was written in 1862, when the question of opening up a route from the late Province of Canada to the Red River Settlement and British Columbia, had become to be generally and warmly discussed.

It was the object of the writer to point out, how, in his opinion, the great work could be undertaken in the most advantageous manner, having in view the circumstances which then existed.

Events have marched rapidly since that time, in consequence of which the mode of proceeding with construction may, in some respects, be considerably modified, and under the altered circumstances the rate of progress then contemplated, may now be greatly accelerated.

The system propounded in 1862, however, embraces certain economical principles, which appear as appropriate and applicable to-day as they did twelve years ago and, therefore, they may profitably, be again considered.

It was at first intended to make only one or two extracts from this article in order to illustrate the advantages of what is termed the "Territorial Road System," but the whole subject is so important and of so much interest at the present time, that it is considered advisable to print the article *in extenso*

OTTAWA, January, 1874.

APPENDIX A.

OBSERVATIONS AND PRACTICAL SUGGESTIONS

ON THE SUBJECT OF

A RAILWAY THROUGH BRITISH NORTH AMERICA.

Submitted to the Government of the Province of Canada, by SANDFORD FLEMING, *in the year* 1863.

A communication for commerce between the western and eastern shores of North America, through the great basins of the St. Lawrence, the Saskatchewan, and the Columbia, has for nearly two centuries been a dream of the enthusiast. So far back as 1679 Robert Cavalier de la Sale formed to himself the magnificent scheme of opening a way to China and Japan through the Lake Regions of Canada; and curious enough, the rapids and village of Lachine, near Montreal, took their names, either in honor or in derision of La Sale's project, when he set out on his grand enterprise. About fifty years later Charles Marquis de Beauharnois, Governor of New France, projected an attempt to communicate with the Pacific, and in pursuance of which Pierre Gauthier de Varennes set out in 1731 and was the first to reach the Rocky Mountains.

Of late years the project has been brought prominently before the public in England and in Canada by many writers, amongst others, Lieut. Millington Henry Sygne, R.E., in 1848; Major Robert Carmichael-Smyth, and Mr. Wilson of the Hudson's Bay service, in 1849; Allan Macdonnell, Esq., in 1850, and Captain Thomas Blakiston, R. A., in 1859. Each

laid their views before the public, and warmly advocated the importance of opening up the interior of British North America by a highway from ocean to ocean.

In 1858 the Provincial Legislature of Canada incorporated a joint stock company for the purpose of opening up the interior and trading therein This body, entitled "The North-West Transportation Navigation and Railway Company," was granted most extensive powers; besides trading in furs, tallow, buffalo meat, hides, fish-oil, and other articles of commerce, the company was empowered to improve and render navigable the various channels of water communication; to construct links of roads, tramways, and railways, between navigable lakes and rivers, so as to provide facilities for transport from the shores of Lake Superior to Frazer's River. They had likewise the right to own and employ vessels of all kinds "upon Lakes Huron and Superior, and upon all the waters, lakes and rivers lying to the northward and to the westward of the latter, thereby offering to their energy and their enterprise a new and vast field for commercial adventure." The directing board of this company was the same year fully organised, it embraced some of the leading names connected with Canada, but from some cause it has as yet made little progress in the objects contemplated.

From the above brief sketch of the history of the projects of establishing a highway from Canada across the continent it appears that it has from the earliest settlement of the country bordering on the Atlantic, been considered a magnificent scheme for the extension of commerce and civilization; the Pallisser expedition across the Rocky Mountains, as well as the Red River, the Assinniboine and Saskatchewan expeditions, show that it has very lately received the attention of the Imperial and Colonial Governments; the recent discovery of gold on both slopes of the Rocky Mountains, gives it much additional interest, and lastly, the difficulties between the United States and the Imperial Governments, for the present happily set aside, have not failed to show its vast importance as an engine of military defence.

It seems likely, then, that although the means of transport for nearly 2,000 miles are as yet scarcely better than they were when La Sale attempted to traverse the continent almost two centuries ago, the time is rapidly approaching when a highway across the continent will no longer by any one be viewed as visionary.

Before proceeding to consider the construction of the work practically, it will be necessary to discuss its character, and profitable to view its magnitude.

ITS CHARACTER.

A CONTINUOUS LINE OF RAILWAY ADVOCATED.

The early French projectors appear to have had the idea of opening a water communication to the Pacific through the lakes and rivers of Canada and the interior. Nearly all the recent writers on the subject have proposed in different ways to improve and render navigable the natural lines of water communication. I am not aware, however, that any of the latter, by reason of their knowledge of the great Rocky Mountain barrier, have contemplated a route wholly by water; they have generally advocated a mixed system, employing the water channels as far as possible, and connecting them by intermediate links of roads or of railways. On the other hand, Captain Blackiston appears to be much in favor of a land route, for the present, at least from the north shore of Lake Superior to Red River, by the North end of Lake of the Woods, at some distance inland from the international boundary line; and Major Carmichael Smyth in 1849 boldly urged the construction of a "British Colonial Railway" to connect *without break* Halifax on the Atlantic with the mouth of Fraser's River on the Pacific.

All the schemes proposed may be reduced to two kinds, viz.: partly water and partly land; and wholly land routes; the former may possess the advantage in point of cheapness in construction, but certainly not in regard to efficiency. By using the lakes and rivers as far as navigable or capable of being made so, and by constructing connecting links of roads or railways where necessary to complete the chain, it is more than likely that a line of communication could be formed from ocean to ocean at less cost than could a continuous land route;—a mixed land and water route would, however, be always open to the following objections: it would to a great extent, confine colonization to the banks of rivers and lakes where the soil is not invariably most suitable for cultivation. It would involve many transhipments, and be liable to frequent interruptions. It would necessarily be considerably longer than a direct land route, and, as means of transport for "through traffic," would be slow and tedious,—it would too, and this objection is insuperable, be only available for any kind of traffice during less than six months in the year.* It is well known that serious delays frequently arise on canal

* The navigation of the lakes and rivers on the line of route are closed from the middle of November to the 1st of June.—BLAKISTON.

navigation before the season terminates towards the close of navigation by reason of the press of business. The longer the the route the greater would be these difficulties; merchants at either end, unwilling to run the risk of having goods arrested in the interior for half a year, would in consequence be debarred from sending consignments across the country for some considerable time before the water channels were completely closed, and hence it is believed that a partly land and water route would not be really service able for "through traffic" over five months in the year. The local traffic of the interior would likewise be suspended for long periods, and at such times the country and its inhabitants would be as much isolated as they are now. In a military view alone this objection would prove fatal to any permanent route of an amphibious character; and it is probably on this ground, together with the fact that the water lines pass for a considerable way along the international boundary, that the two military gentlemen last named have extended their advocacy to a line of communication wholly by land through the interior.

A railway communication on the other hand would be the shortest practicable line that the physical features of the country would admit,—it would have no transhipments between tide water on the two oceans,—it would in most instances be carried through the heart of the country at some distance from lakes and rivers, and would thus open valuable tracts of land for colonization which could not be reached by navigable waters; when it touched or intersected water channels, these would form natural branches to it, and be available to their fullest extent in laying open the land along their banks for settlement. It would, as an essential and independent part of its equipment, be provided with an electric telegraph; the telegraph, as on other lines, would be available for purposes beyond the immediate requirements of the railway, and without doubt great benefits would result from the possession of this instantaneous means of communication.* The railway would throughout the year be open to transport "through" as well as "local" merchandise and passengers, and would, taken with the telegraph, in a military aspect, be avail-

* A telegraph would be much more expensive in the first place, and almost impossible to maintain on any line across the country other than a railway or other travelled land route, if carried around lakes or through hundreds of miles of uncleared forest, the wires would constantly be broken by fallen timber, and the posts frequently destroyed by running fires, inconvenient interruptions might thus occur when the telegraph was most in need. On a railway it is part of the duty of the trackmen to look out for fallen trees, and a break is thus speedily repaired when it occurs: when the line is cleared to a sufficient width, interruptions from this cause are not frequent.

able at all times and seasons, and would undoubtedly prove an important as well as a permanent measure of defence to the country.

It is not, however, to be supposed that the operating of a railway through this extensive country would be entirely free from difficulties; the permanent supply of fuel would be a question of no little moment, the intense frosts and the snow drifts of a long winter would have to be contended with. The latter is found in operating Canadian as well as other railways in a like northern latitude, to be a cause of not unfrequent interruptions to the regular running of trains, besides often the necessity of a heavy outlay.

The drifting of snow, like all operations of nature, is, however, governed by certain laws, and it is possible on a correct knowledge of them to adopt measures in the general design of railways and their appliances which may certainly diminish if they do not entirely remove the evil effects of the agency referred to. These questions will be more particularly noticed in their proper place.

Taking all things into consideration, and, notwithstanding the difficulties last mentioned, it seems as clear as a demonstration that a continuous line of railway, with its electric telegraph, extending across the continent, is much to be preferred to a mixed system of navigation and railway combined; and therefore in the following observations it will be understood that a line of railway is the character of the highway ultimately in view. It is true that in preparing the country for railway service the natural water channels as far as they go may be advantageously employed, but it would evidently be unwise to incur much expenditure on any route other than that best calculated to accommodate the permanent wants of the country and highest interests of the Colonial Empire.

ITS MAGNITUDE.

COST AND MAINTENANCE OF A RAILWAY AND TELEGRAPH LINE

Having determined the character of the means of communication most desirable to be established, it may be well now to glance at the comparative dimensions of the proposed work, and to consider the cost of its construction as well as the annual expense of maintaining it for ever afterwards.

Measuring on the map along the general route of the proposed line from the mouth of Fraser's River, through one of

the best passes yet discovered in the Rocky Mountains, along the general direction of "The Fertile Belt," keeping south of the North Saskatchewan, crossing the Red River near the Settlement, bridging the Winnipeg River at the north end of the Lake of the Woods, striking through the country to the most northerly bend of the shore of Lake Superior, thence in a direct line to a crossing on the French River west of Lake Nipissing, and from this point connecting with the existing railway system of Canada, either at the Town of Barrie, or at Peterboro, or at the City of Ottawa; the distance thus measured will be found to be in round numbers about 2000 miles, and although a railway between the two oceans on British territory, cannot be considered perfect without the completion of the road between Halifax and the most easterly extension of the Grand Trunk in Lower Canada, yet as there is some prospect of this section being made independently, it does not appear necessary to embrace its length in the present consideration.

That a just conception may be formed of the real magnitude of the project under discussion, and the means necessary to its attainment, attention may for a moment be drawn to a few leading details. The construction of 2000 miles of railway measured by the average standard of similar works existing in this country implies the performance of labourers' work sufficient to give employment to 10,000 men for five or six years,—it involves the delivery of 5,000,000 cross-ties or sleepers, and over 200,000 tons of iron rails for the "permanent way"—it comprises the erection of 60,000 poles hung with 1000 tons of wire for the Telegraph—it necesitates the creation of motive power equivalent to over 50,000 horses, which power would be concentrated in 400 locomotives—it involves the production of from 5000 to 6000 cars of all kinds, which, coupled with the locomotives, would make a single train over 30 miles in length—and lastly it implies a gross expenditure on construction and equipment, of not less than $100-000,000.*

It will likewise serve as a salutary check on hasty conclusions to weigh before hand the cost of operating a truly gigantic establishment of the kind after its perfect completion; a few figures derived from actual results will show that the first construction of a railway through the interior of British

* Major Carmichael-Smyth estimated the cost of building a line of railway from Halifax to the Pacific at £150,000,000 sterling, equal to over $700,000,000, but then he computed the expenditure as on English railways, where more money has been wasted in preliminary expenses and lavished on architectural monuments at Stations than would suffice to build an equal length of road in this or any new country.

North America is even a less formidable undertaking than that of keeping it afterwards open in the present condition of the country. For operating the line successfully, the fuel alone required in each year, and estimated as wood, would considerably exceed 200,000 cords—for keeping the road in repair a regiment of 2,000 trackmen would constantly be employed in small gangs throughout its entire length; for the same purpose there would on an average be annually required 600,000 new crossties as well as nearly 30,000 tons of new or re-rolled iron rails—the annual repairs of Rolling Stock would not cost less than one million dollars—over 5,000 employés of all kinds would constantly be under pay, and as these men would usually represent each a family, there would not be far short of 20,000 souls subsisting by the operation of the road. The aggregate amount of wages in each year after the road was in operation would swell out to nearly $2,000,000, while the gross expenditure for operating and maintaining works would annually exceed $8,000,000.

Again, if to this last sum be added the interest on first cost it becomes evident that until the gross earnings of the railway in each year come up to the enormous sum of $14,000,000, it could not pay the interest on the capital invested

ITS IMPORTANCE.

A GREAT NATIONAL WORK, A FIELD FOR LABOUR, AN ENGINE OF MILITARY DEFENCE.

The above computations taken by themselves are more than sufficient to deter any one from casting a second thought on the subject of constructing a railway through the unpeopled wilds of British North America; but when we again reflect on the vast importance of this great national work the belief is forced upon us, that at some period, *let it be a remote one*, the undertaking will certainly be accomplished. While most authorities have very fully dwelt upon the commercial advantages to be attained by a speedy means of communication across the country—while they have shown its value as a connecting chain between British Columbia, the Gold Fields on the slopes of the Rocky Mountains, the Settlements at Red River, and the Atlantic Provinces, as well as a link of connection between China, India, even Australia, together with other Dependencies on the Pacific, and the Parent Land—while they have advocated it as the key to a new and almost boundless field for British capital, energy and

enterprise—as a great instrument of colonization, opening up a territory of vast extent for the superabundant and rapidly increasing population of the European States, and in this respect involving the future and permanent interests of civilization—yet it has not been the good fortune of the writer to peruse any article in which this undertaking is viewed as a most important measure of defence; as a work which may at some period save many millions sterling in carrying on a war, which may, if it does not prevent a war, save the Colonial Empire from dismemberment.

In times of Peace we are apt to overlook the importance of being able to concentrate troops and munitions of war at any given point on our extended frontier, but the recent difficulties between the British and American Governments, could not fail to illustrate the military value of the several Canadian railways as well as the isolated and defenceless condition of the far interior. Had war not fortunately been avoided, it is difficult to see how that vast and prospectively most valuable territory between the Lake District and the Rocky Mountains could have been protected from invasion and permanent occupation, and we are forced to the conclusion that until a highway is formed the interior of our country is indefensible. The Romans paid particular attention to the construction of roads through the distant Provinces of the Empire, and while the construction of these roads was one of the grand causes of civilization introduced into barbarous States, the great leading principle that actuated the builders of them, was that of maintaining their military supremacy; the first efforts of that people were directed to piercing new acquisitions to the Empire with good roads, and these roads wherever practicable were connected in unbroken lines with the seat of government at Rome. The remains of these roads are still to be traced in various ramifications through Europe, and so substantially were they constructed that they have for fifteen centuries perpetuated the power and foresight of their originators.

In modern time, Napoleon, one of the greatest, if not the greatest military authority, announced the maxim that the highest effort of the military tactician was to concentrate a given number of men at a given place, at a given time. It requires no argument to prove that the Railway and the Electric Telegraph are the most perfect means for concentration of military power that could possibly be desired, and we can easily perceive with what comparative ease forces could be brought to bear through the instrumentality of these agents, on any point threatened with invasion.

True, we are again at peace with our neighbours to the south, and perhaps likely to remain in that happy state for a considerable time, but possibly not always; some good authority has laid down as a maxim, that to maintain peace, a nation must be well prepared for an opposite condition of things, and therefore we must see the value of the railway route to bind the several North American Colonies of Britain together. But it is not alone as a work of defence that the British Pacific Railway would be serviceable in a military sense; it connot be forgotten that within a very few years back British troops had to be transported with the greatest possible rapidity to India and again to China. Such exigencies may at any time occur again, either in the same lands or at other points in the same hemisphere, and it must be of the utmost importance to the Imperial Government to possess the means of carrying military forces more rapidly by a route over entirely British soil, than by any other route along which they may come in contact with antagonistic nations.

I have already overstepped the limits of space which these preliminary remarks should have occupied, but I cannot proceed to the more practical part of the subject without first alluding to the efforts which for more than half a century have been made by the Imperial Government to discover a means of communication by water between the Northern Atlantic and the Northern Pacific Oceans. Although the persevering and sometimes heroic attempts to find the north-west passage have resulted in no direct advantage, beyond a trifling contribution to science and geographical knowledge, yet they are undoubted evidence of the high commercial and military value which the British Government has long placed upon the possession of a means of communication between the two oceans in the northern hemisphere; and while the expenditure of a sum considerably over a million pounds sterling has only proved that a passage through the Arctic Seas *cannot* be established, the very impracticability of the passage which the outlay of so much treasure as well as the loss of so many valuable lives has demonstrated, must without doubt add immensely to the importance of the only practicable route across the continent, on British soil.

SCHEME OF CONSTRUCTION.

THE COMPLETION OF THE RAILWAY A WORK OF TIME.

The idea of constructing upwards of 2,000 miles of railway in the manner which has characterized the establishment of similar undertakings heretofore, through a country almost uninhabited except by scattered bands of wandering Indians, may well be viewed as a commercial absurdity. It has been shown that the maintaining and operating of a railway of this extent, after its perfect completion, would cost not less than eight million dollars per annum, and that its traffic would have to yield in gross receipts fourteen millions of dollars every year to enable the work to pay interest on the capital invested.

Could it be satisfactorily shown that these receipts might even be approached, the work would undoubtedly be a legitimate investment for private capital, and we might fairly expect to see it undertaken by private enterprise; but at present no such inducement can be held out; however important the line would be in many respects, the business of the country traversed could not for many years yield more than a fractional part of the revenue required to keep it open, and the traffic from ocean to ocean could not be expected even by the most sanguine to give constant and profitable employment to a force of four hundred locomotives, without which the road would scarcely pay.

It appears conclusive therefore that the immediate construction of a railway from Canada to the Pacific is in a financial sense impracticable, seeing that it would not at present pay; and however important it may be considered as a great national work, its successful operation as a commercial undertaking cannot take place until the country is better prepared for it.

It must not however be implied that the idea of establishing a continuous line of railway from ocean to ocean should even at the present time be set aside. It may be laid down as a maxim, that wherever traffic *can exist* sufficiently extensive in any section of country, to render the application of steam power profitable, through that section, a railway will sooner or later be constructed. The country between Canada and the Pacific is, according to reliable authority, in every respect capable of supporting a large industrial population*

* Assuming that only that portion of British America west of the Lake of the Woods and south of the main or North Saskatchewan River, is capable of being populated to no greater density than Russia, the least populous country in Europe,

half as large perhaps, even at a moderate computation, as the population of the whole United States—the population of the whole United States sustains over 30,000 miles of railway, and therefore we may reasonably conclude that long before the interior of British America is fully occupied, a leading line of railway communication through it may be successfully operated and profitably sustained.

The question of opening up new territories for settlement by means of some comprehensive and economical road system engaged my attention a few years ago, when I had the honor to read two papers on the subject before the Canadian Institute, and I cannot but think that some of the conclusions then come to, apply with peculiar force to the subject under discussion. In one of these papers a retrospective view was taken of the process by which the Province of Canada had become habitable and inhabited, so far at least as lines of internal communication had been instrumental in producing these results; and an analytical examination of the existing road and railway systems was made, as well as an enquiry into the means employed to produce them. From these enquiries, instituted with the view of arranging some more perfect system of road development, for advantageous introduction into unoccupied districts, certain deductions were drawn, of which the following may at present be submitted.

In carrying railroads, the most perfect of all roads, into remote unsettled districts, two great difficulties have to be encountered at the outset:—First, their construction; secondly, their maintenance.

The former may be overcome by a process which strongly resembles a law or principle in mechanical science, by which we are taught that time is an element of equal importance to power in the performance of mechanical operations. The construction of a railway with all its parts is nothing more than a complex mechanical operation, whilst capital or money may be designated the force or power employed to bring about the desired result; a large expenditure of financial force is undoubtedly required to accomplish the object within a short period, but owing to the peculiar relation between power and time the employment of a small amount of force or capital

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Norway and Sweden excepted, within these limits a population of 15,000,000 would be contained, (the density of the population of Russia is only about one-third that of the settled portion of the Canadas). The occupation of this portion of the country need not be considered a great encroachment on the territory from which the Hudson's Bay Fur Company derives its revenue; it would still leave 2,000,000 square miles, an area four times greater than that assumed to be populated; an area quite as extensive as Russia, and abundantly sufficient, it is presumed, for a hunting ground.

would equally accomplish the same end in a longer period; both of these elements are indispensable, but they are not necessarily required in fixed proportions; if we use the maximum of the one we only need the minimum of the other,—if circumstances in any particular case will not justify a large expenditure of capital, then time may be extensively employed to accomplish the work in hand.

The second difficulty above referred to, viz.: that of maintaining a railway in a new district after its completion, although by far the most serious of the two, is one which fortunately can be removed by a particular solution of the first. It is obvious that to put a railway in a condition of being self-sustaining, the traffic of the country through which it passes must first be developed; for however important and promising the "through traffic" of any projected line may appear, experience has shown on nearly all railways that the "local" or "way traffic" is that upon which they must mainly depend for a revenue. The local traffic of a new territory can only be developed by the introduction of labor and inhabitants; this is a work of considerable time even under the most favourable circumstances, but until this be done it is useless to expect sufficient traffic, and without sufficient traffic the railway cannot maintain itself.

In applying the foregoing to the question of forming a railway connection between Canada and the Pacific, it would follow that whilst the completion of the work at the earliest period possible, would absorb an enormous amount of capital, and leave the line for many years without the means of earning sufficient to sustain itself, the gradual process of construction would draw upon capital only to a limited extent, and it would leave the railway finished when the traffic was sufficient to keep it in profitable operation.

The former course may fairly be rejected as incompatible with the first principles of economy, the latter being perhaps the only alternative, forces us to the conclusion that the gigantic work under consideration, to be constructed at all must be viewed as a work of time; and it remains for us to consider how the time at command can be most profitably employed to bring about the desired result.

THE ROAD SYSTEM OF CANADA,

CONSIDERED IN VIEW OF A COMPREHENSIVE PLAN FOR NEW TERRITORIES.

In pursuance of the object in view, it may be satisfactory and profitable to refer briefly to the leading characteristics which have marked the origin and improvement of the roads as well as the introduction of railroads in the settled portion of Canada.

The settled or partially settled portion of Canada embraces an area estimated at 35,000 square miles; its road system or means of inter-communication, exclusive of navigable channels, consists of nearly 2,100 miles of railway in full operation, of probably 3000 miles in the aggregate of improved roads, comprising those made of broken stone, gravel and plank, and in round numbers of 50,000 miles of what are termed road allowances; of the last it is estimated that considerably less than one-half the total length is cleared of the timber and so far improved as to be passable for waggons, the remainder being as yet uncleared and in part permanently impassible.

The road allowances demand some explanation; they are invaribly one chain (66 feet) in width, and are left between the square or rectangular blocks of farm Lots, into which the whole country has been subdivided for settlement; they are consequently in parallel lines, and in two sets, the one crossing the other at right angles, leaving blocks between, of two or more farm lots of 200 acres each.

The aggregate area of these road allowances is extremely liberal, as it cannot be much less than 400,000 acres, but from the manner in which the allowances are laid out they cannot in all cases be employed for the purposes intended; they are, however, much used by the farmers in common for pasturing cattle. Where the country is level and free from lakes, rivers or other obstructions, the road allowances have been converted into good summer waggon-roads by the annual performance of statute labour, and they give ready access to the farm lots; where the countryis hilly or broken on the other hand, great difficulty has been experienced in makingthem passable, and in many instance this is impossible, wh lst in some cases, after a great deals of money and labour hid been expended, the original road allowances have been abandoned for better locations.

As the settlement and trade of the country advanced, a demand was made for a more improved class of highways on the leading lines of traffic; this led to the construction of

plank,* gravel, or broken stone roads through different parts of the country and may be said to constitute the second stage in the development of the road system.

As the road allowances were left in the original surveys more to mark the limits between blocks of land than to accommodate the future commercial wants of the country, they did not long remain the only means of communication between one business point and another. Increasing traffic frequently called for roads with easier grades than those to be had on the original road allowances, and in cases where it sought an outlet diagonally across the country, it demanded a shorter line than the old rectangular zig-zag one; in this manner new and more perfect roads were constructed in various sections of the country.

The third and last stage in the establishment of lines of internal communication within the Province, was the formation of railways; these were first introduced about ten or twelve years ago when the increasing commercial wants of the country appeared to demand a greater degree of rapidity, safety and security of transport.

Although the location of railways through any district requires a higher degree of care and skill than that of gravel or other roads of like character, yet it is governed by precisely the same principles; and as the general direction of all lines is prescribed by the leading direction sought by traffic, we find that the various lines of railway have been constructed parallel, or at least in a parallel direction to the various stone or plank roads which have preceeded them, although they are frequently found at some distance asunder: this is a peculiarity which cannot fail to have been observed by all those acquainted with the country.

From the above brief outline of the original history of the lines of commercial intercourse within the Province, it will be seen that three distinct classes of roads have at different times been constructed to meet the requirements of traffic. *First*, we have common earth roads on the original road allowances. *Second*, gravel, plank or broken stone roads in improved locations. *Third*, railways constructed quite independently of the other two—showing as a rule that three distinct works have been made, involving as many separate expenditures before the final object is attained. The only exceptions to this rule are where the second class have been made on the lines of the original road allowances, but the

* The first plank road was built in Upper Canada in 1836.

exceptions have perhaps been even more expensive to the country than when the rule has not been departed from. *

It may also be observed that the system adopted has in minor details unavoidably resulted in many permanent inconveniencies to the trade of the country, which under other arrangements might have been obviated; as an illustration it may for the present be sufficient to allude to the inconvenient distances which nearly all the railway stations are from the towns and villages they are intended to accommodate. It may further be noticed that a degree of competition likewise obtains between the parallel lines of communication throughout the country, alike injurious to the interests of both. A stone road running parallel to a railway cannot fail to share with it the traffic of the locality, perhaps just sufficient to prevent the latter line from paying, while the former is deprived, by the more recent work, of the revenue it had a right to anticipate when originally constructed. True it may be said that the country benefits by the rivalry between parallel lines; this, however, is very questionable, as both roads cannot permanently continue to be maintained at a loss; they must either fall out of repair or the tolls must be raised to enable them to pay dividends. Could these stone or other improved roads, instead of being parallel to the railways, be extended as branches to them from the stations, it is apparent that then the country generally would derive greater advantages, while the different classes of communications, in performing their proper functions, would receive corresponding benefits to those they conferred.

* In a report made by Thomas Roy, Esq., Civil Engineer, in 1841, to the Governor General of Canada, reference is made to the excessive cost of making good roads on the line of original allowances drawn staight through the country across ravines, over hills, through swamps and other hinderances. Amongst other cases where attempts have been made to construct improved roads on such lines as that alluded to, he instances the following: "The grants were made to macadamize Yonge Street Road from Toronto to Holland Landing, near Lake Simcoe. Now Yonge Street Road was so located that it was extremely difficult and expensive to form it into a tolerably good road. On that portion which has been already done, nearly as much money has been expended in cutting hills, building bridges, &c., as in road making; yet several of the inclinations are as steep as 1 in 14. That portion which remains to be done, is still more difficult, and it will be more expensive. Now, if previously to commencing the work an experienced Engineer had been instructed to examine the country and to lay out a road upon the best ground which he could find between Toronto and Holland Landing, he would have discovered that between 3 and 5 miles west of Yonge Street Road, a line of road could have been got from Toronto to the base of the Ridges, (about 25 miles,) without crossing one ravine, or meeting any difficulty except the hill on the north-west of Toronto; and farther, that the Ridges could have been crossed in that direction without involving any considerable difficulty. The result is that the same amount which has been expended in making about fourteen miles of a very indifferent road, would have made about thirty miles of excellent road, leaving no inclinations steeper than 1 in 40; a circumstance that would have produced a great saving in repairs, and in expense of animal strength."

It is not for a moment presumed that a re-arrangement of existing lines of traffic such as that suggested is now possible; but these remarks are offered with the view of showing some of the benefits which would result from a pre-arrangement of internal communication in a new country, such as I will take occasion to refer to shortly.

Before attempting to show how we may best profit by the experience obtained from the Canadian road system in any effort to colonize the interior of British North America, I will first allude to another point which doubtless has suggested itself to many others, and which I think is of some moment.

If we proceed to annalyse that portion of a perfect railway upon which the trains are rapidly transported, we find that it consists essentially of the following parts: 1st, Two smooth, parallel and horizontal surfaces upon which the wheels of the carriages roll; these are formed by iron rails resting upon cross-ties and supported by chairs or other fixtures; the whole being termed "the permanent way" or "superstructure." 2nd, A layer of gravel or broken stones from fifteen to thirty inches in thickness immediately under and around the cross-ties, and technically called "the ballast." 3rd, An earthen surface uniformly even and properly ditched at the sides. This surface is termed the "formation level" and on it the ballast is placed and thus proceeding downwards from the completed rail track we have:

1st. The permanent way.
2nd. The Ballast.
3rd. The Formation Level.

To those who have observed the successive stages of railway building, it will be clear that "The Formation Level" is not dissimilar, except in possessing easier grades and curves, to the best description of "common earth roads," and might readily be used for all the purposes for which the latter are employed. Again, when "the Formation Level" becomes coated with "Ballast," we have what is designated "the Road-bed," and which, without any portion of the "Superstructure," corresponded with the general construction of "Gravel" or "Stone Roads." If, therefore, we invert the order above given, and likewise substitute new names, we have,

1st. *An Earth Road*, corresponding with the Formation Level.
2nd. *A Gravel or Stone Road*, corresponding with the Road-bed.
3rd. *A Railway.*

This is precisely the order in which the leading lines of communication have been formed in Canada, and although

each work as a rule has been constructed independent of the other, and thus necessitated separate expenditures to accomplish one end, yet it does not appear a difficult matter to point out how the same object can be better attained in new territories to be settled, by a simpler and less costly system. Were the railway line first located, the common classes of roads which naturally precede it might first be made (on the railway location) and used until each in its turn merged into its successor; and by such a plan it is clear that considerable savings would result on the final establishment of the railway; there might be new earth-works needed where the ground was broken by ravines and hills, as well as stronger bridges across rivers, but no outlay would be necessary for land, or for clearing and grubbing, at any place, and on level sections of the line, such as occur on all roads, the only additional expense would be that for the superstructure.

A ROAD SYSTEM FOR NEW TERRITORIES.

TOTALITY AIMED AT, AND PROVISION FOR FUTURE RAILWAYS ADVOCATED.

From the foregoing observations it must be obvious that the progress of new territories, as well as their future and permanent social and commercial wants, would be much influenced by a pre-arrangement of the various lines of internal communication; and it must be equally clear that to attain the highest degree of easy intercourse between every section at the least outlay of capital and labour, every road of whatever class should be considered as a portion of a whole system.

The system of construction proposed to be advocated is that of a gradually progressive character, similar to that already hinted at; and inasmuch as it would evidently be a misnomer to designate the various lines of roads in their rudimentary stages by the names they may ultimately be intended to bear, it is thought that the following terms for the three classes of lines will be convenient and sufficiently appropriate.

1st. *Territorial Roads.*—These trunk lines, intended to serve large districts, and which may in course of time be converted, stage by stage, into railways, as the settlement of the country advances and its traffic becomes developed. "Territorial Roads" to be invariably located with easy curves and on the most available ground for railway service.

2nd. *Colonization Roads.*—Those lines of secondary importance, to be opened in the first place for the better introduction

of settlers, and which may without change in their direction be converted in course of time into good gravel or macadamized roads.

3rd. *Concession Roads.*—Those lines of least importance, designated simply to give access to farm lots from the leading lines last mentioned. Concession roads might be laid out generally across the colonization roads, and between the several blocks into which townships are usually sub-divided.

In pre-arranging a system of internal communications for a new territory, it would be necessary to take a prospective view of the character of the traffic which might exist when after a lapse of years the district becomes populated; in this we might be guided by drawing a comparison between the natural advantages of soil, climate, and position of the section of country to be colonized, with those of any similar section which has become occupied and to some extent developed. In this manner we could form some idea of the nature of the future commerce of the country, and consequently of all the classes of roads which would ultimately be required to accommodate it. The leading direction which traffic may seek, or the direction which in a national or political sense it may appear expedient to guide it, would prescribe the general direction of the main line of road through the territory, and other considerations would determine its character. This is the first thing to be established, as upon it the direction and character of all minor lines mainly depend.

Assuming that the tract of country to be colonized is such as to justify us in the belief that in due time a railway may be constructed through it, the first step would be to lay out a "Territorial road" between the more important points in the general direction of traffic previously determined. The territorial road ought to be located with the utmost care, and in all that relates to curvatures and levels, on the best railway location in an *engineering aspect alone*, which the country traversed could afford. In this respect there would doubtless be less than usual difficulty, as there would be neither right of way obstacles to guard against nor local interests to serve, and consequently no undue influences to twist or warp the intended line out of the most advantageous location. The main artery of traffic for the future service of the country might thus be determined upon under most favourable circumstances.

It would next be necessary to select at proper intervals the most suitable points for stations and villages, and from these as diverging points, "Colonization Roads" might then be laid out to the right and left with as much care as the location of

gravel or macadamized roads generally require. These colonization roads thus laid out and adapted to the peculiar features of the locality, avoiding steep hills, ravines, lakes, or unnecessary river crossings, might form centre or governing lines upon which the townships may be projected; these townships to be sub-divided in the usual way into blocks of farm lots with concession roads between, drawn so as to unite with the colonization roads.

The above is a simple skeleton outline of a road system which it is thought might with advantage be introduced into unoccupied fields; and although it may be unwise to complicate it with too many details, still there is one additional point which seems too important to be passed over. I have already alluded to the difficulty experienced in operating railways where the road is liable to be blocked up with snow-drifts;* and I may now refer to the extreme necessity of making some provision for the permanent and convenient supply of timber for fuel and general repairs.† As a preventive against the

* It has been pretty well established that the most efficient preventive of snow-drifts is to preserve the woods along each side of the rail-track beyond the line of fences. Trains are seldom detained by snow evenly fallen through wooded parts of the country, as it scarcely ever falls so deep "between trains" as to offe any inconvenience. The detention to trains from snow always occurs in the open country where the woods have been cleared away and no obstruction is presented to the formation of snow-drifts on certain exposed positions.

† In districts where no coal exists and in consequence wood is employed as fuel, and more especially in those sections of the country where the absence of navigable water channels renders a more expensive system of land transport necessary, it would seem good policy to husband the growing timber for future wants. Already in some parts of the United States the difficulty and expense of procuring fuel for railways and for other purposes is beginning to be felt; in Canada the railways alone consume not far short of 300,000 cords every year, thus involving the annual destruction of more timber than is generally obtained from an area of six thousand acres, and in all countries in a northern latitude, beyond the convenient reach of coal-fields, the conservation of sufficient areas of timbered lands must become of increasing political importance. To ascertain the extent of woodland sufficient to yield a permanent supply for a given rate of consumption, the writer a few years ago initiated the following steps: A piece of average timbered hard wood land was selected, a rectangular portion was staked off, within the limited area each tree was separately examined, the length and circumference of the trunk and main branches as well as the thickness of the rings of annual growth of each were ascertained, and upon this data was calculated the quantity of solid wood annually produced by the process of vegetation. The result gave about 60 cubic feet of solid timber to the acre, and allowing for the interstices between each stick as usually piled, this may be considered equal to about three-quarters of a cord; consequently to yield a perpetual supply there ought to be one and a third acres of timber land reserved for each cord of wood required annually.

Taking the above as correct and assuming that a railway with ordinary traffic consumes annually 150 cords of wood for every mile of road operated, it follows that 200 acres should be reserved for the growth of fuel for every mile of railway. In like manner it can be shown that cross-ties or sleepers would require about 40 acres for every mile, and fencing as much as 24 acres for each mile of railway. It appears obvious, therefore, when we consider the many other purposes to which timber is applied in the maintenance of a railway and its rolling stock, that there ought to be about 300 acres per mile reserved for the growth of timber for all purposes. A belt extending a quarter of a mile beyond each side of the line of road would fully embrace the required area.

former, and as an ample provision for the latter, I would suggest that a belt of woodland along the territorial line of sufficient breadth should be reserved for shelter and the purposes above mentioned. The belt of woodland to be at all effective against the worst effects of snow should be of a considerable width, sufficient in fact to shelter the line of road and arrest the snow-drifts beyond the limits of the line of traffic. In open sections of the country it might, in view of the same end, be advisable to encourage the growth of timber on reserves to be left for the purpose along the line of road. The uniformly even falls of snow would of course always occur, but on railways these are easily overcome by light snow ploughs attached to the front of the engines, and they seldom interfere with the regular running of trains.

These continuous timber reserves along the sides of the territorial road, whilst they would greatly lessen the difficulty of operating a railway along the same line in winter,* as well as provide a permanent supply of wood for fuel and general repairs, they would, moreover, result in several incidental advantages favourable to the construction and maintenance of the future railway as well as to the safety of the public.

As all the roads in every section of the country along the line of the intended railway would connect through the "Colonization Roads" directly with the stations, the traffic would naturally centre at these points, and at these points *only* would railway crossings by public roads be required. Again, there would be no private or "farm crossings" needed, as the farm lots being laid out subsequent to the location of the road, would of course be wholly either on one side of it or the other, besides being separated from the road by the timber reserve. The advantages resulting from these arrangements would be threefold, viz.: in original construction, subsequent maintenance, and public safety. In original construction it is clear that no bridges, level crossings, cattle guards or gates would be required at any part of the line, other than at stations, to accommodate public roads, and at no place whatever would farm crossings be needed. In maintenance, corresponding advantages would result, as the repairs of these works, generally of a perishable nature, would be for ever saved, and the constantly recurring damage from cattle straying on the track would be very greatly lessened. Public safety would

* The obstacle presented by snow-drifts is *the great difficulty* in the way of operating railways in winter in high latitudes. The cost of clearing away the drifted snow on some portions of the Canadian lines, in the winter of 1860-1861, was very great. The drifts invariably occurred where the adjacent country was cleared of its timber.

undoubtedly be greatly promoted by any plan which would diminish the number of road crossings. In any country subdivided for settlement in a manner similar to Canada, before the railway lines are laid down we cannot avoid having the road crossings almost one in each mile, so that on every one hundred miles of railway we have probably in the aggregate over 5,000 lineal feet of track not only destitute of protection but exposed day and night to waggons, foot passengers, and cattle passing to and fro. Besides which the great number of cattle guards required is an important element of danger. These being made of timber beams are equivalent to small wooden bridges, and their great number swells out the total length to something very considerable. On all the railways in Canada the cattle guards, it is estimated, cannot measure less than 20,000 lineal feet of track, and are probably not much less dangerous than the same length of wooden bridges. In addition to the public road crossings above alluded to, there are a very great number of ordinary "farm crossings," which in point of safety to the public travelling by rail as well as to the property of the railway companies, are perhaps equally to be feared, for although they are protected by gates these are constantly liable to be left open, either through the design or negligence of farm servants.*

In the road system recommended for new districts, the railway whenever it came to be operated would be entirely freed from farm crossings, and the public road crossings would only occur at stations, where the danger of accident is always least, from the fact that the speed of trains is invariably reduced at these points.

Before proceeding to consider how the road system suggested would apply to the wide areas of unoccupied lands in the interior of British America in view of colonizing them, as well as ultimately establishing a leading line of railway from the settlements of Canada to the Pacific, I may observe that two principal objections present themselves to the system advocated

* "One of the most fruitful sources of accident are the great number of crossings of street, highway, and farm roads at the level of grade. The total number of these is over eight thousand and there is an average of three to each mile of road in operation, and more than one public road or street crossing to each mile. It is believed that nearly ten per cent. of all the accidents by which persons were killed or injured, is due to this cause.

"The expense of maintaining watchmen at many of these crossings, and the damage to the property of the companies by collisions caused by them, render them costly.

"The policy of reducing the number of those at grade, is generally conceded; and it is recommended that authority be given to change road-crossings which are at the level of grade, whenever it can be done without much detriment to the travel, so as to have two or more roads use one crossing; and, in all cases, where it can be done at a reasonable expense, to require them to be carried over or under the railroads."—*Report of the Board of Railroad Commissioners to the Legislature of the State of New York*, 1856.

The expense of making the surveys and laying out the land for settlement would, undoubtedly, be much greater than that required to lay out wild land in the usual manner; but then while the old plan is simply to divide the country into rectangular lots without any sufficient provision for future traffic or present access, the new plan has a double object in view; it has in addition to the purposes contemplated by the old system, that of making every part of the country accessible in the readiest way at the minimum expenditure, and with the greatest permanent advantages attainable. Another objection arises from the proposal to keep the territorial road lines wooded on both sides except where stations may occur, thus rendering the road less agreeable to travel on than if the cultivated country was allowed to be immediately adjacent. This is undoubtedly an objection, but I think that it cannot weigh much when the benefits to be expected ultimately from the preservation of the wood is fully considered.

A HIGHWAY TO THE PACIFIC.

A PLAN OF GRADUAL DEVELOPEMENT RECOMMENDED.

In the foregoing observations it has been my endeavor to show, as briefly as possible the following points:—

1st. That the project of a highway to the Pacific is as old as the first settlement of Canada, and that recent events show its increasing importance.

2nd. That a continuous line of Railway, with Electric Telegraph, is better calculated to meet the permanent wants of the Country and serve the interests of the Colonial Empire than any other means of communication between the two oceans.

3rd. That although the magnitude of a scheme for a Railway across the continent is very great, yet the vast importance of the work in a commercial, military, and national view would demand its construction were the resources of the country, and the trade sufficiently developed.

4th. That the immediate completion of this work cannot be seriously entertained in the present condition of the country, the cost of maintenance without sufficient traffic being so very great, and that therefore, to be constructed at all, the Railway must be a work of time.

5th. That the Canadian Road and Railway system has illustrated the advantages which may be derived from the adoption of a comprehensive Road scheme, in laying open new districts for settlement.

6th. That a scheme which embraces the ultimate completion of Railways and less perfect lines of communication, by a progressive system of construction, possesses many features favorable to the first settlement, as well as the future requirements of the traffic, of new Territories.

7th. That the system proposed for the developement of the highways of a new country by progressive stages corresponding with the progress made by the country itself in general advancement, is one peculiarly applicable to the case under discussion; and while it might be expedient, in the first instance, to employ some of the natural water channels as a means of introducing settlers and laborers along the line of road, until the latter became in some degree serviceable, it would not be advisable to incur any great expenditure on works beyond the limits of the great thoroughfare ultimately in view. That the first effort should be made to construct an Electric Telegraph along the precise line of the future Railway, that the Telegraph should be the precursor of other means of communication, beginning, it may be, with a Bridle Path or Indian Trail from post to post, and ending with a perfect line of Railway, when the traffic of the country, or the interests of the nation required the most rapid means of steam communication.

With these remarks I will now attempt to show how the work, in its different stages, may be proceeded with.

The first step required is the location of what has been designated a "Territorial Road" between all the more important or governing points on the line of route. Commencing at the Western Terminus, these points would probably be, the mouth of the Fraser River, or the best Harbor on the Pacific coast, north of the 49th parallel—the best pass which has been or may be discovered across the Rocky Mountains contiguous to a line which would run along the general direction of the "Fertile Belt"* of the interior—the most southerly bend of the

* "There is a broad strip of fertile country rich in water, wood and pasturage, drained by the North Saskatchewan and some of its affluents; and being a continuation of the fertile prairies of Red River, the eastern water-shed of the Assiniboine and Red Deer River, with the outlying patches called Touchwood Hills, File Hill, &c.

"It is a physical reality of the highest importance to the interests of British North America, that this continuous belt can be settled and cultivated from a few miles west of the Lake of the Woods, to the passes of the Rocky Mountains, and any line of communication, whether by waggon-road or railroad, passing through it, will eventually enjoy the great advantage of being fed by an agricultural population from one extremity to the other.

"No other part of the American Continent possesses an approach even to this singularly favorable disposition of soil and climate; which last feature, notwithstanding its rigour during the winter season, confers, on account of its humidity, inestimable value on British America, south of the 54th parallel.

North Saskatchewan River—the best crossing of Red River between its confluence with the Assiniboine and the southerly end of Lake Winnipeg—The best crossing of the River Winnipeg near the north end of the Lake of the Woods—the most northerly bend of the shore of Lake Superior—the best crossing of the French River between its junction with Lake Huron and Lake Nippissing—and lastly, the most desirable point of connection with the existing Railway system of Canada either at Ottawa, at Peterborough, or at Barrie, all of which points are directly connected with the Grand Trunk Railway by means of the branch lines running southerly to it. On the location of the "Territorial Road," which could only be done on a careful survey of the country, the next step would be the determination of Station points from whence to lay out Colonization Roads to the right and left, wherever the soil was favorable for settlement. Upon the Colonization Roads the townships should next be projected.

So soon as any section of the road can be finally located, together with its branches, the introduction of settlers might commence. The road should be cleared through the wooded districts to a width of two chains or 132 feet, in order chiefly to preserve the Telegraph, when erected, from being injured by trees falling. The clearing would at once give employment to settlers, and with subsequent work in improving the road, greatly aid them in paying for their land and in supporting their families until their farms produced sufficient crops. Throughout the open prairie country, which is more than one-third of the whole distance, the trouble and expense of clearing would be avoided; but as the great natural obstacles which isolate the interior and prevent the possibility of establishing a Telegraphic communication through the country are the wooded and broken districts at both extremities, it becomes indispensable to force a way of communication through them: this is doubtless a work of considerable labor and corresponding expenditure, but without it no satisfactory progress can be made. This preliminary step is especially requisite to the east of the Red River valley, so that settlers might obtain access to the central plains, and in view of the construction of a continuous line of Telegraph at an early day, to be followed by a waggon road as soon as circumstances would allow, the Territorial line should be cleared through the western division likewise.

"The natural resources lying within the limits of the Fertile Belt, or on its eastern borders, are themselves of great value as local elements of future wealth and prosperity; but in view of a communication across the continent, they acquire paramount importance."—*Narrative of the Canadian Exploring Expedition: H. Y. Hind.*

The "Territorial Road" from the settlements of Canada to the valley of the Red River would pass through a country only partially explored and consequently but little known; it must be said however, that what is known of it is not very favorable. More careful surveys, of a portion of the country recently made by the Canadian Government have shown that a large section formerly considered worthless is really fitted for settlement, and is now being rapidly occupied; and it is hoped from this circumstance that at least a portion of the land along those sections of the line yet unexplored is capable of being cultivated.

To begin at one end of the road and gradually extend the settlements northward and westward would, perhaps, be too tedious an operation in view of the importance of opening an early connection with the interior. It would, therefore, doubtless be advisable to begin at several intermediate points accessible by water from Lakes Huron and Superior, and proceed with simultaneous operations. On referring to the map it appears that such points exist at distances ranging from 50 to 90 miles apart, and from these as bases the clearing of the road could proceed in both directions at the same time, while settlements could be formed wherever the soil proved favorable. In due time the clearings, penetrating the forest to the right and left along the line of Road previously located, would pierce the country from one end to the other, and the same being accomplished in a similar manner in the western division, a continuous line of Electric Telegraph might then be constructed.

The extreme importance of the Telegraph communication extending from colony to colony across the country, even during the earliest stages of settlement, is too apparent to need comment, and being constructed on the precise line of the intended waggon road and of the ultimate Railway, it would always be in the position where its services would be called into requisition.

While the Territorial line through the eastern division gradually became developed into a good waggon road by the labor of the settlers and such grants of money as its importance appeared to warrant, it is probable that the Canoe Routes from Lake Superior to Red River might by partial improvement be made serviceable for ingress and egress during summer to the interior; and with the object of promoting emigration to the central plain as well as to other points along the line of Road, it would probably be expedient to improve these routes by a limited outlay, but for the reasons already given I cannot help thinking that it would be the

wisest policy to concentrate the chief expenditure on that line which must be sooner or later the leading highway through the country.

The expenditure of labor year by year on the Territorial line, as the country at the same time progressed in settlement, would gradually produce a regular stage road capable of being travelled with considerable rapidity; and which would serve all the purposes of transport from one point to another, until the increasing traffic was considered sufficient to maintain a line of steam communication. When that period arrived, comparatively little additional expenditure would be required to complete the line of railway, had proper care been exercised in locating the Territorial road in the first instance, and in constructing the work in its subsequent progressive stages. It is believed that probably not less than four-fifths of the whole length of the line might be ready for conversion into a railway, simply by laying the superstructure of cross-ties and rails on the surface of the macadamized or gravelled road-bed; at other points permanent bridging and reduction of grades would be called for.

I would rather refrain from expressing an opinion as to the amount and mode of expenditure on a work conducted as above suggested, as so little is known of several important sections of the line of route, and so much depends on other considerations of detail. I may, however, by way of illustrating one of a variety of methods by which the general design of the scheme might be carried out, submit the following, premising, that while it is intended that the chief part, if not the whole of the cost, up to a certain stage, should ultimately come out of land sales, it would be necessary for either the Imperial or Colonial Governments to appropriate, in advance, sufficient to defray preliminary expenses; and perhaps it would be advisable that all expenses should be borne in this way up to the completion of a continuous line of Telegraph, to connect the chain of little colonies which would spring up along the line of route. All these expenses might be made a charge against the general Territorial Revenue of the country benefitted, a revenue which would only begin to augment when the lands became easily accessible and were made productive by labor.

It has already been shown that the success of a railway to the Pacific would mainly depend on the possibility of introducing a sufficient number of inhabitants in the country to be traversed; if the population of the country is to govern the period when a railway should be set in operation, we may likewise take it as the basis of annual expenditure on the

preliminary stages of the work. Suppose the average annual increase could be reckoned at 100,000 souls,* and that it be determined to expend annually on the works a sum equal to one dollar per head of the whole population in each respective year, the following results in the development of the undertaking might be obtained: -

1st. In from three to four years, besides the expense of surveys, a territorial road line might be located throughout; the wooded districts which extend over a length of more than 1400 miles, might be cleared to a width of two chains; and a continuous line of telegraph constructed from Canada to Fraser's River.

2nd. Within a further period of two years a road passable for wheeled vehicles might be formed along the whole line of route.†

3rd. Gravel on macadamized roads of the very best description might be completed, in addition to the foregoing, in the following order:—

(1) From Lake Superior to Red River, a distance 400 miles, in nine years from the present time.

(2) From the mouth of Fraser's River to the Rocky Mountains, a distance of 400 miles, in eleven years from the present time.

(3) From the settlements of Canada to Lake Superior, a distance of 650 miles, within fourteen years from the present time.

(4) From Red River to the Rocky Mountains, a distance of 800 miles, within seventeen years from the present time.

And thus by the comparatively trifling annual outlay of one dollar per head of the assumed gradually increasing population, we could secure in less than four years a line of telegraph, and in thirteen years more a substantially constructed gravel road throughout the whole length of the line The next and final stage of progress would be, the completion of the Railway on the line thus, in a great measure, prepared

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* In the whole United States, which country resembles the one under discussion more closely than any other, there are about 1000 inhabitants to every mile of Railway in operation. It would scarcely be safe to estimate that a line through British America could be profitably sustained with a less proportion of inhabitants per mile of its length. The whole length will probably be found to be between 2000 and 2500 miles, and hence the population ought to be from two to two and a half millions. It would thus require 20 to 25 years, even with an annual increase of 100,000 to give the requisite number.

† This would be a common earthen road on the natural surface of the ground, unless where grading and ditching is required; it would be similar to the colonization roads so economically opened by the Canadian Government through the wild country between Lake Huron and the Ottawa, as well as in other districts. Within the last four or five years a total length of nearly 500 miles has been opened, at a cost of about $250,000.

for it; and in view of the traffic then created, as well as the comparative economy in construction, it might be undertaken in sections by private enterprise, or in such other way as might then appear most expedient.

I am not prepared to say that the foregoing is the best order of sequence in which the several sections and stages of the work should be constructed; it is simply presented for the purpose of showing what might be accomplished by a small annual expenditure. It is not at all unlikely that the peculiar nature of the traffic might warrant the conversion of some section of the route into a railway at an early period, —possibly that section between Lake Superior and Red River would be the first to require the change, which of course could be made without difficulty at any time, so soon as it appeared that the trade of the country was sufficient to maintain it. The order of sequence is not important, but it is an essential part of the system proposed for opening up this vast and roadless country, that every portion of the work done should form a component part of a perfect whole, and that whatever expenditure is made, whether it be one thousand or one hundred thousand dollars, should be laid out in the right place in accordance with a thoroughly digested and well matured plan; the great object in view being to obtain the maximum result of good from the minimum amount of outlay.

I can scarcely hope that the plan of gradual development herein advocated will satisfy the precipitate or the impatient, —those, in fact, who would urge the immediate construction of the Railway, regardless or ignorant of the cost and the burdens it might in consequence entail upon the country—yet there are many who, remembering the tortoise in the fable, will perceive that a slow yet certain movement will accomplish the desired end with as much certainty and perhaps more satisfactorily than if the work was undertaken with the most sanguine hopes of speedy achievement. It is very doubtful, however, if any one, will on reflection, assert that there is really a choice of methods, that is to say, a fast and a slow one—the line of artificial highway proposed to be constructed extends over not less than forty-five degrees of longitude, equal to one-eight of the length of a circle of latitude passing entirely around the globe; the undertaking, therefore, becomes one of no ordinary magnitude, and when in connection with it, half a continent has to be redeemed in part at least, from a state of wild nature, some considerable length of time must necessarily be occupied in the process. Even if it should take a quarter of a century, it would be equal to an average construction of

100 miles of railway a year, as well as the annual introduction of 100,000 emigrants And, after all, a quarter of a century is but a brief period in the history of a country—half that length of time has already elapsed since the railways of Canada were first commenced, and yet many are of opinion that it would have been better, in some respects, had only one-half the extent of existing lines been yet constructed.

As the character of the work is so colossal and the condition of the country such as to debar the idea of undertaking the construction of a Railway through it in the usual way and as an ordinary commercial enterprise, I am emboldened to think that such a system as I have endeavoured to sketch, might form the basis of a scheme possessing many recommendations, and which it is confidently believed might be advantageously adopted in any attempt to establish a great leading highway through the vast unoccupied Territory between the settle ments of Canada and British Columbia.

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With regard to the establishment of an Electric Telegraph and Post Road, from Canada through the Red River district to British Columbia, a few words may be added. Assuming that the reasoning of the writer in another place in favour of developing the resources of new districts, by the adoption of a comprehensive road system, is correct; it seems quite certain that the application of the principles laid down for opening up, by means of territorial roads, the leading highways of a new country, if applied to the development of the vacant districts in the interior of British North America, would result in most important advantages. A territorial road is understood to be the precursor of a railway; its establishment is recommended in every case where prospective traffic may possibly render steam power, as a means of conveyance, profitable or necessary; and this is considered essentially one of these cases. If the building of a railway be at the present time inexpedient, who will venture to say, in view of the many millions of fertile acres stretching in a wide band across the central plains to the rich auriferous valleys of the Rocky Mountains, and in view of the sudden impulse which the gold discoveries must give to properly directed emigration and colonization, that a railway will not follow in the path of a simple road across the continent before another generation has passed away? The late prosperous Republic was until lately fed by a living stream of population from the densely inhabited countries of the old world. That stream is, however, interrupted by the unfortunate difficulties of our neighbours. May not this stream, by opening a proper inlet, be

diverted into a new channel, and may not the whole of British America benefit thereby? If a portion of the immigration which has hitherto swelled the ranks of the American Republic, could be led to our own prairies by a route which would make them as near and as accessible as those on the Mississippi: a Post Road and a Telegraph through the country would meet with abundant employment; a demand would soon be created for an improved means of communication, and on some sections, railway service would speedily be called into requisition.

By opening up a territorial road and erecting a line of telegraph across the country, steam and electricity, the great civilizers of the present century, would obtain a foothold on the wide, dreary, and as yet uncultivated wastes in the far interior; and although it might be said that the seeds only of the former would be sown, the latter would bear immediate fruit; time and labour would develope the former, while the latter would stimulate these agencies in their work. For many reasons it is thought that an electric telegraph ought to be erected along the precise line of the intended railway, at the earliest possible moment; in addition to its value in a military and commercial aspect, as an instantaneous means of communication between the two oceans, it would aid greatly in the work of colonization; it would enable points, isolated in other respects, to express their wants and wishes,—settlements springing into existence a hundred or a thousand miles distant, would always be aware of each other's progress, and be made acquainted with important events as they transpire; and thus the pioneer, although for a time remote from civilization and its accessories, would at least feel less secluded by being within instantaneous hearing of them.

It is part of the plan proposed that the territorial road should be constructed and improved from a rude beginning through gradual stages, in harmony with the progress of the country, to the highest degree of perfection required by traffic. It is thought that both the development of the road and the settlement of the country would in this way be much enhanced,—road work and settlement keeping pace with each other to the mutual benefit of both; and in this connection it appears possible to adopt a system for disposing of the vacant lands, more inviting to settlers when properly understood, and certainly more advantageous to the country at large, than "The Free Homestead Law" of our neighbours. While any person over a certain age, by that law, may secure in the United States an unoccupied lot of land in the remote west, on payment of fees amounting in all to about $15, and on cul-

tivating the land for a period of five years,—there is no provision whatever made for making the land accessible; the settlers must find their way in and out as best they can: the question and cost of opening roads and bridging streams is left entirely with the pioneer cultivators, and in consequence, necessarily becomes a great drawback to general progress, as is always the case when the opening of roads is left to individual fancy and exertion. It is believed that a better plan would be to give any one a farm lot, who, in return, would expend a certain number of days' labor under authorized direction on the leading thoroughfares. Suppose, for example, the lands were laid out in lots of one hundred acres each, and that to secure a patent it were required of each occupant to give ten days' labor in each year for a period of ten years. Labor is the capital of an industrious, poor man; he has this to invest and nothing else; with it, however, he would thus be enabled, not simply to secure a homestead, but one made accessible and valuable by good roads.

A concentration of labour in this way, year by year, on a "Territorial Road Line," previously established, would in course of time prepare it for a railway track, while the occupation and cultivation of the land would prepare the country for railway service. This, it is true, would be a slow process, but one, nevertheless, which could not fail to prove certain in its results; as the planting of an acorn in due time produces a gigantic oak, so in the manner indicated the expenditure of a small capital in the first place, with a systematic direction of industry afterwards, would cause a great national highway to be developed by a natural and unfailing process.

Were such a scheme as that proposed once adopted, and a comparatively small sum expended on the construction of a simple, even a rude, waggon road, and on the erection of an electric telegraph on the best railway line within British territory, there would be no fear, it is confidently believed, of the final result. The rude waggon road would be more than the embryo of a Railway from ocean to ocean, it would be the rudimentary spinal column of a country covering no less than sixty degrees of longitude, and which, in the providence of events, may become an important power on this continent,—while the telegraph would at once resemble the spinal cord of a national nervous system which must yet ramify in many directions throughout this great division of the Colonial Empire.

APPENDIX B.

EXPLANATION.

The following Memorandum (Appendix B.,) was prepared with the view of guiding the Board of Directors of the Pacific Railway Company, organized under the Charter, dated February 5th, 1873. It was also brought bofore the Government and thus became an official public document.

APPENDIX B.

CANADIAN PACIFIC RAILWAY.

MEMORANDUM BY SANDFORD FLEMING, FEBY., 1873.

The undersigned having been requested to submit his views with regard to the principles which should be laid down in organizing the scheme for the construction of the Canadian Pacific Railway, under the Charter recently granted by the Government, the following observations are presented for consideration :—

It may be assumed that it is the desire of the Government, the Company, and the people of the Dominion generally, that this great national work should be successfully completed; that it could not be held to be successfully completed unless constructed in such a way as to leave it when finished in a condition to do its work properly and remuneratively. This certainly would not be the case if, in the process of construction, all the liberal resources granted by the Government were swallowed up, and the road left burdened with a debt which no future traffic could support or remove.

As it is not intended to build the Railway in the first place better or more imperishable than Railways are ordinarily built through New Territories in the United States, it should be borne in mind, that after the line is opened throughout, a large annual outlay will be required for works of repair and renewal. The periodical expenditure of new capital on works of repair and restoration is a very common occurrence even in this portion of Canada, where the Railways were originally constructed in a much more permanent and substantial way than the standard which it is proposed to adopt for the Pacific Railway.

It must be further borne in mind that all the traffic for the line under discussion has to be created, and although the writer confidently believes that in time the traffic will be created, and will ultimately yield a return which would render a prudently constructed Railway self-sustaining and profitable, yet this could not possibly be the case for many years. It appears to follow therefore that until this period arrives, there must be an annual deficit in operating the line, to be periodically added to the debt of the Railway.

It cannot in the opinion of the writer be reasonably expected that the Canadian Pacific Railway can become self-sustaining until a considerable population, (say 3,000,000 at least) has been thrown into the country through which the road will pass. Assuming this theory to be correct, and it must be so, to a greater or lesser degree, then an estimate of the length of time required to throw into the now unpeopled territories, the necessary population, will give an approximate idea of the length of time during which the operating expenses must be expected annually to augment the debt upon the road.

Considered under its financial aspect the undertaking presents four great sources of future difficulty. It is well from the outset to look these difficulties fairly in the face, in order that we may see how they can best be met. We cannot indeed expect to remove them altogether, but by prudence and foresight we may hope to reduce their influence.

The four sources of financial difficulty, are:—

1st.—The original Bonded debt.
2nd.—The interest on the same.
3rd.—Additional debt for renewals.
4th.— ditto for operating losses.

The first two are by far the most serious, as they will keep on compounding and accumulating year by year, and it is self-evident that the larger they are in the first place, the more rapidly will they become unmanageable.

An originally heavy Bonded debt, with an interest debt accumulating yearly, and with fresh debts periodically added for the renewals of perishable works, and for operating losses, all compounding year by year, and augmenting the original debt, would be apt to lead in a short period to a disastrous state of things.

Now is the time to consider how to avoid such disasters as those foreshadowed, disasters which every right thinking man in the Dominion would regard as a national calamity.

With the view of securing all the capital required for the completion of the work, it has been seriously proposed to issue bonds to the amount of $180,000,000. Now what does this imply? It implies $10,800,000 interest annually, and how is it to be met? would the whole subsidy in cash, and the net proceeds of all the land, if sold, pay this amount of interest for ten years? and where would be found the additional capital required for necessary repairs and renewals and to make up operating losses? Would not all these items of expenditure, compounding year by year, *roll up a formidable debt, hopelessly beyond the ability of any traffic to bear.*

These considerations are presented, not by way of discouragement, but in order to show the imperative necessity of commencing this great enterprise, with prudence, forethought and good management, in order that the issue may redound to the credit of all concerned, and those final disasters to which an opposite course must inevitably lead, may be happily avoided.

The undersigned having given the whole subject the fullest consideration and made himself moderately familiar with much of the country, through which the Railway is to be built, has arrived at the conviction that in order to make the undertaking as great a success as possible, the following points must be kept prominently in view.

(1) All interest bearing liabilities must be avoided as far as it is possible to do so, they must at all events be kept down to the lowest minimum.

(2) No more money must be raised in any one year than can be judiciously and prudently expended in that year.

(3) Construction must not be unduly forced, so as to enhance its cost.

(4) In order to prevent the waste or misapplication of capital in the construction of the road, it should be laid down as a rule, that in no case should the construction of any part of the line be commenced, until the necessary surveys, so far as practicable, are thoroughly made and the best possible location selected; this rule should be especially observed in all the more difficult sections of the country through which the railway will pass.

As all Bonds issued must necessarily bear interest and as the money realized from the sale of Bonds will generally be subject to charges of various kinds, it is plain that the fewer the Bonds issued, the lighter will these charges be and the smaller will be the interest which the enterprise will have to carry.

The major part of the expenditure on the actual construction of the Railway will be for labour and as much of the labour will be performed by men who will it is expected, ultimately take up land and settle in the country, it appears quite feasible to pay for a considerable portion of the work in land.

It would of course be inconvenient to both employer and employed to pay away and receive so many acres of land, for so many days work, but there is nothing to prevent the transaction being carried out with scrip, redeemable in land. Such an arrangement would prove advantageous in more ways than one. It would effect a sale of so much land, it would accomplish so much work, would obviate the necessity of

borrowing so much money, and would relieve the undertaking of all the charges connected with the sale of Bonds, as well as the interest payable thereon annually. Incidentally it would materially promote the settlement of the country, and give those engaged on the work of construction a personal and direct interest in its permanent prosperity. In accelerating the settlement of the country, it would in a corresponding degree hasten the time when the line would become self-sustaining.

Having made these observations, it is now important to consider what amount of capital will really be required to to carry out the undertaking, and what proportion of it, it will be possible to expend in a judicious manner, year by year.

These are questions upon which it is absolutely necessary to arrive at an early decision, as the Company's delegates are on the eve of proceeding to England for the purpose of ascertaining the terms upon which the fund required for the work can be borrowed.

Let us then endeavour to form an estimate, however rough, of the probable cost of the whole line, in sections.

In view of the standard of construction adopted for the line, and assuming that the principles herein advocated, of constructing the road without extravagant haste, be adopted, the following estimate will probably be found sufficiently liberal.

Pembina Branch	$ 1,300,000
Lake Superior to Red River	14,700,000
Red River to Rocky Mountains	26,000,000
L. Nipissing to L. Superior Junction	23,000,000
Rocky Mountains to Pacific	35,000,000
	$100,000,000

Should however the attempt be made to push on the building of the road with undue haste, the undersigned would not be surprised that double this estimate would in the end be found insufficient. The increase of cost would, of course, depend upon ths degree of undue haste employed in forcing on the work.

Taking as a basis the estimate above given, the next important enquiry is, what portion of the amounts assigned to each section would it be possible to expend advantageously in each year.

After giving this branch of the subject most careful consideration, the undersigned submits the accompanying table,

as indicating, as nearly as the data in his possession will enable him to do, the amounts which it may be practicable to expend annually, on each of the sections of the road, the probable portion of the subsidy available for each year; an estimate of the value of land which may be sold, or the land scrip issued for work done, and the amount which it will be necessary for the Company to provide annually by the sale of bonds or otherwise.

With reference to the annexed Table the undersigned desires to say by way of explanation :—

(1) In estimating the amount of work which can be done advantageously on any Section in a year, it must not be forgotten that the circumstances of the country, will as a general rule, necessitate the begining the work at the end of sections and working from the ends towards the centres. From this cause it will be impossible to exceed a certain limited expenditure in any one year upon a section without expending capital, most disadvantageously.

(2) The amounts set down in the Table as the probable amount of expenditure on each Section, are considered by the undersigned as the *maximum* limit, of the possible judicious expenditure on each Section. He should state, however, that this *maximum* limit is indeed rather exceeded in the amounts set down for the first three or four years, as the estimate of expenditure on the works of construction East of Red River, but the object of reaching the central plains without any delay by the most direct steam communication, is deemed so important that every reasonable effort should be made to accomplish it. It may not be possible to expend the funds estimated in each year on the line between Lake Superior and Red River, but it may probably be considered advisable that the progress of this particular Section, should be accelerated in every way possible and that there should be no danger of it being retarded for the want of a liberal provision of funds.

(3) It is not expected that during the first or second years much work could be done by the instrumentality of land scrip, but it is confidently hoped that after a few years a considerable portion of the whole cost could be met in that way, especially after the completion of the Lake Superior and Red River Section, and when the line was being carried across the fertile plains. Indeed when the road has reached this stage, it is hoped that not far short of one-half the entire cost of construction may be met by the sale of land or the issue of land scrip.

According to the financial scheme herein submitted, the issue of bonds would be in the order which follows:—

Issue in	1873	$1,000,000	say sterling	£200,000.
ditto	1874	2,000,000	"	400,000.
ditto	1875	2,500,000	"	500,000.
ditto	1876	2,750,000	"	550,000.
ditto	1877	3,000,000	"	600,000.
ditto	1878	3,000,000	"	600,000.
ditto	1879	3,000,000	"	600,000.
ditto	1880	3,000,000	"	600,000.
ditto	1881	2,750,000	"	550,000.
ditto	1882	2,500,000	"	500,000.
ditto	1883	2,500,000	"	500,000.
ditto	1884	2,500,000	"	500,000.
ditto	1885	2,500,000	"	500,000.
ditto	1886	2,500,000	"	500,000.
ditto	1887	2,500,000	"	500,000.
ditto	1888	2,000,000	"	400,000.
	Total	$40,000,000		£8,000,000.

The aggregate issue will represent a loan of say £8,000,000 sterling, and it is suggested that in addition to the security of the Railway itself, and all its traffic revenues, eight millions of acres of the best average agricultural land (or one acre for each pound sterling borrowed) be reserved or appropriated for the purpose of paying off the bonds. This it is considered would be ample security. It is confidently believed that the land so reserved would long before the bonds matured, be worth many times the proposed loan, and by limiting the lien on the Company's land to this aggregate area, 42,000,000 acres would be left free to be disposed of for construction for interest, for renewals, and for the other purposes indicated herein.

The suggestions submitted in this memorandum will be found to point to three objects which appear to the undersigned, matters of paramount importance, namely:—

First—To keep down to the lowest minimum, the bonded debt and the other pecuniary burdens which the Company will have to carry.

Second.—So to regulate the work of constructing the road, that the fund employed for that purpose should not be wasted or misapplied, but should produce the maximum result.

Third—To promote incidentally the settlement of the country, through which the line passes and in this way hasten the time when the road will become self-sustaining.

In conclusion, the undersigned is of opinion that if in carrying on this great work, the Company adhere to the general principles which he has ventured to submit for consideration, the line may successfully be completed throughout and put in operation, burdened with a comparatively small debt, and he is sanguine enough to hope that in a very few years after that time the increasing traffic of the country will be sufficient to render the Canadian Pacific Railway not only self-sustaining, but able to do its work with profit to the proprietors, and satisfaction to the country.

Ottawa, February, 1873.

SANDFORD FLEMING.