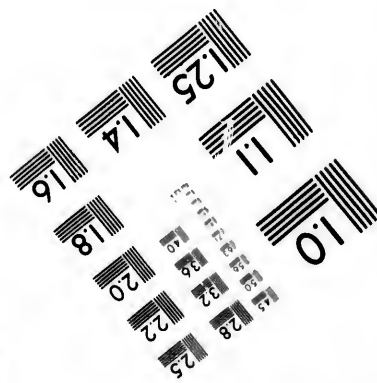
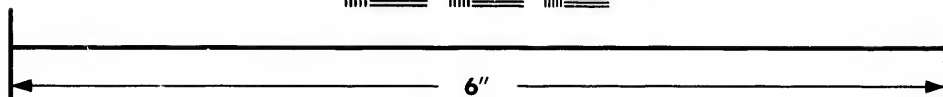
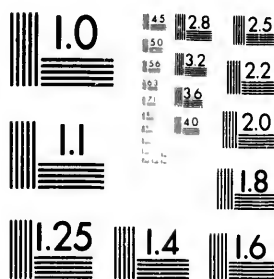


IMAGE EVALUATION TEST TARGET (MT-3)



Photographic
Sciences
Corporation

23 WEST MAIN STREET
WEBSTER, N.Y. 14580
(716) 872-4503

**CIHM/ICMH
Microfiche
Series.**

**CIHM/ICMH
Collection de
microfiches.**



Canadian Institute for Historical Microreproductions / Institut canadien de microreproductions historiques

© 1981

Technical and Bibliographic Notes/Notes techniques et bibliographiques

The Institute has attempted to obtain the best original copy available for filming. Features of this copy which may be bibliographically unique, which may alter any of the images in the reproduction, or which may significantly change the usual method of filming, are checked below.

L'Institut a microfilmé le meilleur exemplaire qu'il lui a été possible de se procurer. Les détails de cet exemplaire qui sont peut-être uniques du point de vue bibliographique, qui peuvent modifier une image reproduite, ou qui peuvent exiger une modification dans la méthode normale de filmage sont indiqués ci-dessous.

- ☒ Coloured covers/
Couverture de couleur
- ☐ Covers damaged/
Couverture endommagée
- ☐ Covers restored and/or laminated/
Couverture restaurée et/ou pelliculée
- ☐ Cover title missing/
Le titre de couverture manque
- ☐ Coloured maps/
Cartes géographiques en couleur
- ☐ Coloured ink (i.e. other than blue or black)/
Encre de couleur (i.e. autre que bleue ou noire)
- ☐ Coloured plates and/or illustrations/
Planches et/ou illustrations en couleur
- ☐ Bound with other material/
Relié avec d'autres documents
- ☐ Tight binding may cause shadows or distortion
along interior margin/
La reliure serrée peut causer de l'ombre ou de la
distortion le long de la marge intérieure
- ☐ Blank leaves added during restoration may
appear within the text. Whenever possible, these
have been omitted from filming/
Il se peut que certaines pages blanches ajoutées
lors d'une restauration apparaissent dans le texte,
mais, lorsque cela était possible, ces pages n'ont
pas été filmées.
- ☐ Additional comments:/
Commentaires supplémentaires:

- ☐ Coloured pages/
Pages de couleur
- ☐ Pages damaged/
Pages endommagées
- ☐ Pages restored and/or laminated/
Pages restaurées et/ou pelliculées
- ☒ Pages discoloured, stained or foxed/
Pages décolorées, tachetées ou piquées
- ☐ Pages detached/
Pages détachées
- ☒ Showthrough/
Transparence
- ☐ Quality of print varies/
Qualité inégale de l'impression
- ☐ Includes supplementary material/
Comprend du matériel supplémentaire
- ☐ Only edition available/
Seule édition disponible
- ☐ Pages wholly or partially obscured by errata
slips, tissues, etc., have been refilmed to
ensure the best possible image/
Les pages totalement ou partiellement
obscurcies par un feuillet d'errata, une pelure,
etc., ont été filmées à nouveau de façon à
obtenir la meilleure image possible.

This item is filmed at the reduction ratio checked below/
Ce document est filmé au taux de réduction indiqué ci-dessous.

10X	14X	18X	22X	26X	30X
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12X	16X	20X	24X	28X	32X

The copy filmed here has been reproduced thanks to the generosity of:

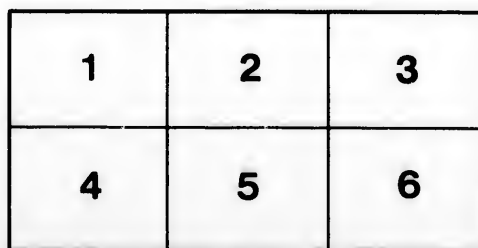
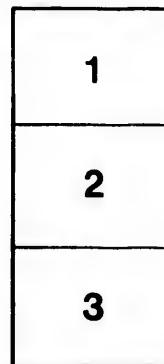
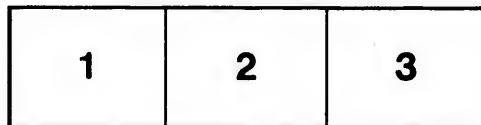
Library of the Public
Archives of Canada

The images appearing here are the best quality possible considering the condition and legibility of the original copy and in keeping with the filming contract specifications.

Original copies in printed paper covers are filmed beginning with the front cover and ending on the last page with a printed or illustrated impression, or the back cover when appropriate. All other original copies are filmed beginning on the first page with a printed or illustrated impression, and ending on the last page with a printed or illustrated impression.

The last recorded frame on each microfiche shall contain the symbol ➡ (meaning "CONTINUED"), or the symbol ▼ (meaning "END"), whichever applies.

Maps, plates, charts, etc., may be filmed at different reduction ratios. Those too large to be entirely included in one exposure are filmed beginning in the upper left hand corner, left to right and top to bottom, as many frames as required. The following diagrams illustrate the method:



L'exemplaire filmé fut reproduit grâce à la générosité de:

La bibliothèque des Archives
publiques du Canada

Les images suivantes ont été reproduites avec le plus grand soin, compte tenu de la condition et de la netteté de l'exemplaire filmé, et en conformité avec les conditions du contrat de filmage.

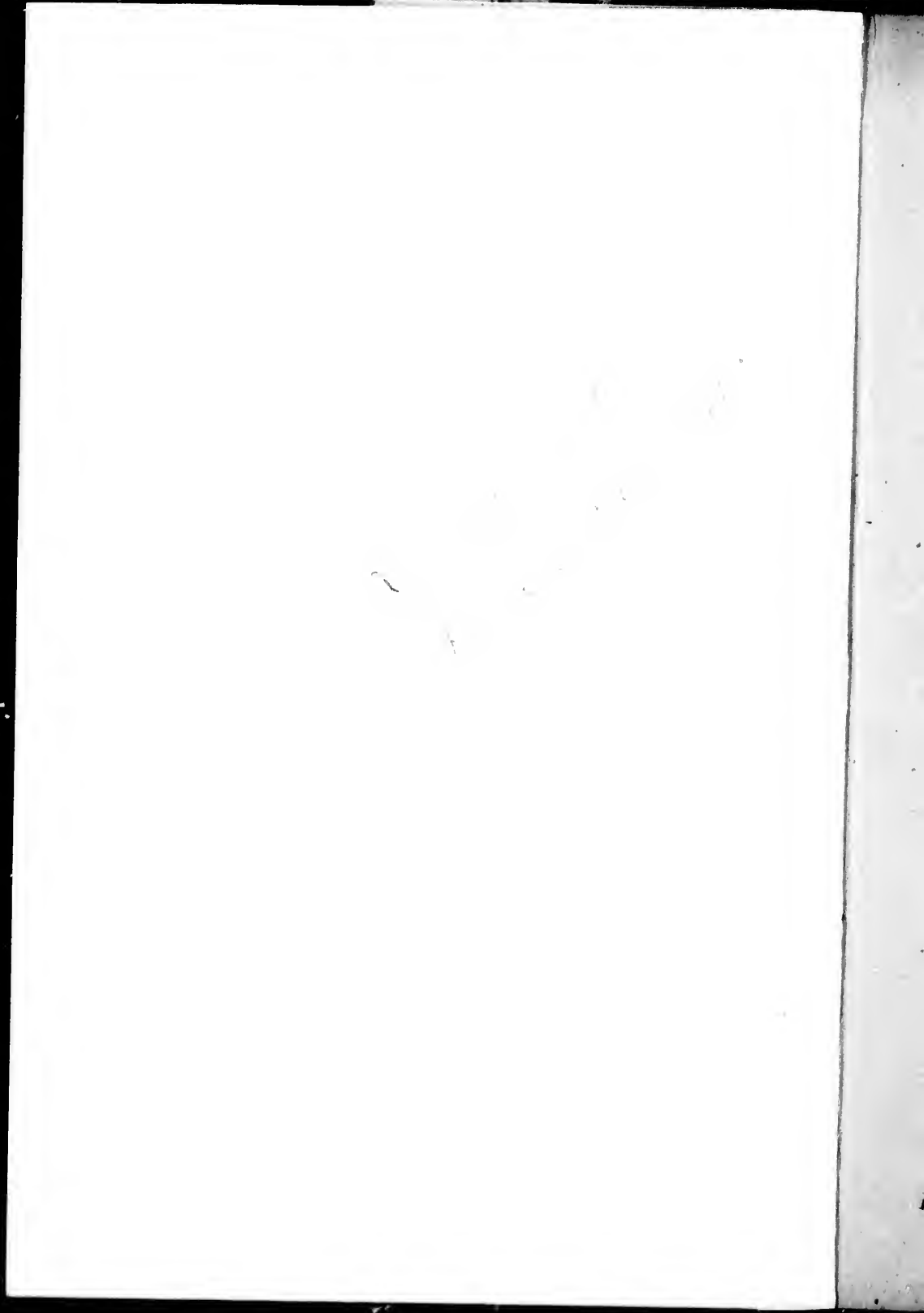
Les exemplaires originaux dont la couverture en papier est imprimée sont filmés en commençant par le premier plat et en terminant soit par la dernière page qui comporte une empreinte d'impression ou d'illustration, soit par le second plat, selon le cas. Tous les autres exemplaires originaux sont filmés en commençant par la première page qui comporte une empreinte d'impression ou d'illustration et en terminant par la dernière page qui comporte une telle empreinte.

Un des symboles suivants apparaîtra sur la dernière image de chaque microfiche, selon le cas: le symbole ➡ signifie "A SUIVRE", le symbole ▼ signifie "FIN".

Les cartes, planches, tableaux, etc., peuvent être filmés à des taux de réduction différents. Lorsque le document est trop grand pour être reproduit en un seul cliché, il est filmé à partir de l'angle supérieur gauche, de gauche à droite, et de haut en bas, en prenant le nombre d'images nécessaire. Les diagrammes suivants illustrent la méthode.

errata
to

pelure,
n à



INLAND NAVIGATION,

WITH

*Suggestions as to the sufficiency of a depth of fourteen feet
in the St. Lawrence Canals, and the practicability of
extending the navigation westward from Lake
Superior, through the North-West Ter-
ritories, to the head of the
Saskatchewan.*

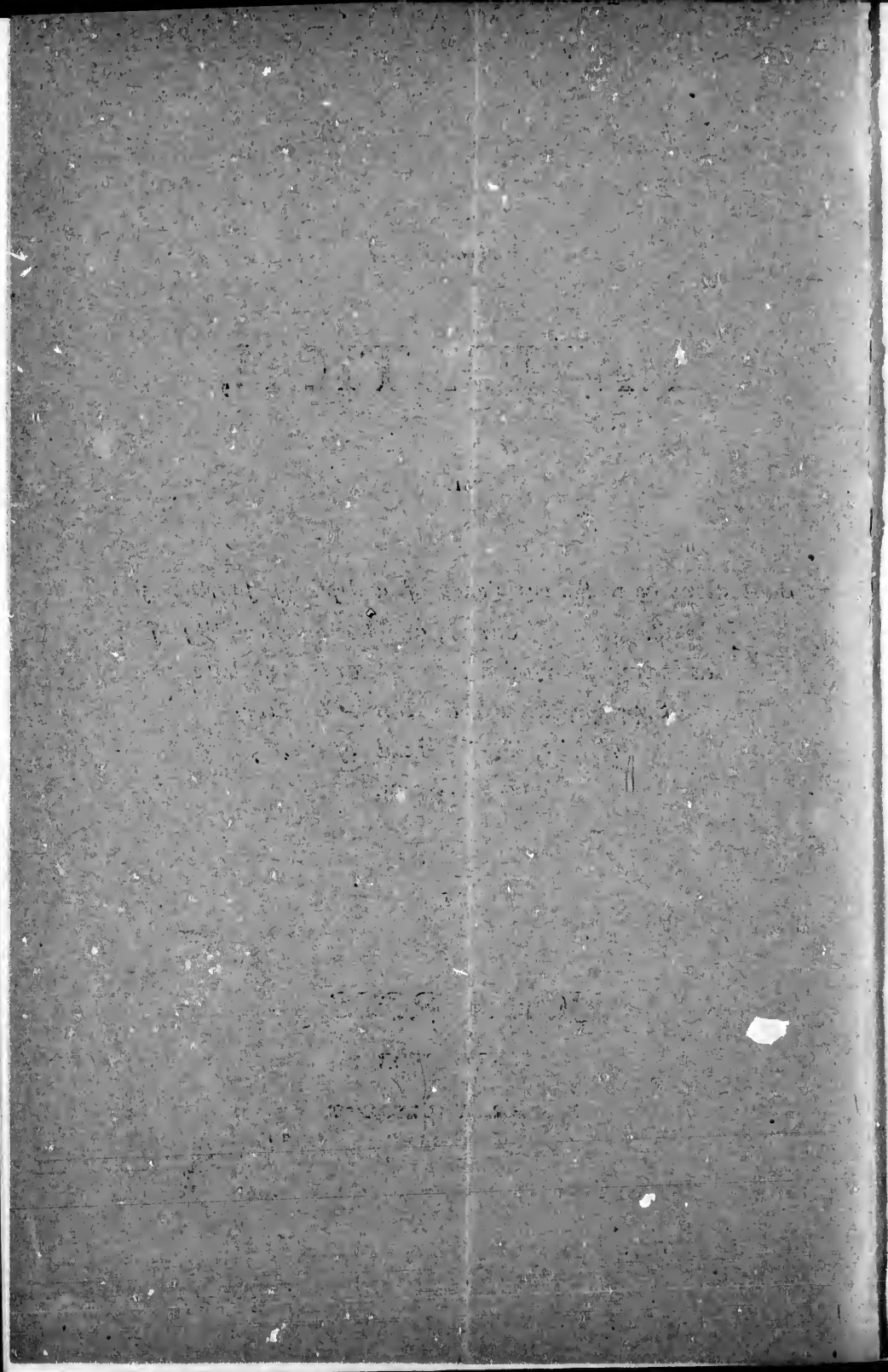
BY

JOHN ROSS,

CONTRACTOR,

NIAGARA FALLS, ONT.

February, 1895.



Our Inland Water-Ways.

With the opening of the canal on the Canadian side at Sault Ste. Marie, a vast extent of inland navigation will be thrown open to vessels drawing as much as 20 feet of water. From Port Colborne and Buffalo to Duluth, a distance westward, by water, of a thousand miles, and from Chicago to Port Arthur, a distance of six hundred miles from south to north, there will be nothing to prevent such vessels from coming into use.

The traffic of the Great Lakes has already reached large proportions, and, as is well known, the freight tonnage passing Sault Ste. Marie, annually, has for years exceeded the tonnage of the Suez Canal, although of course very unequal to it in value.

The convention on water-ways held last summer at Toronto, advocated a depth of from twenty or twenty-one feet from Lake Erie to tide water, but the improvements now in progress along the St. Lawrence will give a depth of fourteen feet, and that should for a long time to come suffice to meet the requirements of the country.

Vessels carrying three thousand tons, or as much as 100,000 bushels of wheat, on a draught of fourteen feet, are now running on Lakes Huron, Michigan and Superior, and to render the St. Lawrence Canals available for them when deepened to fourteen feet, as they soon will be, it would only be necessary to enlarge the locks.

The locks on the Welland and elsewhere eastward thereof are entirely too short for such vessels, but they can, when the necessity arises, be lengthened at no appalling cost. The Engineers who planned the locks on the Welland are not to be blamed for their too diminutive capacity, for at the time they were projected, no one could have foreseen that such leviathans were so soon to be afloat on our inland waters.

Besides, in considering the question of enlarging the St. Lawrence Canals, the route by way of the French River, Lake Nipissing and the Ottawa, as well as the long since projected canal from the Georgian Bay by way of the Trent to the Bay of Quinte, on Lake Ontario, has to be taken into account, for in both of these cases, a depth of far less than fourteen feet would command a large share of the traffic. But these projects, like the twenty feet depth on the St. Lawrence, are questions for the future, rather than the present. All of these great schemes may and likely will be carried out in course of time, when the population of this Dominion shall have become sufficiently great and prosperous to bear the cost. But the all-important step and the one which should the most deeply engage the attention of the country at the present time, is the extension of the navigation from Lake Superior westward through the heart of the continent, so as to develop the agricultural lands of the Northwest territories, in a manner commensurate with their extent and importance; and in this way, bring their traffic to the St. Lawrence and our ocean ports. When the

population of these territories comes to be counted by millions and tens of millions as in course of time it will be, all the railroads likely to be built would not suffice to carry their surplus productions to the ocean, at least, at such rates as would be satisfactory to agricultural communities, but through these wide regions nature has provided a highway, for cheap transportation, which can, at an outlay which the country might well bear, be rendered available.

The old route of the Fur Traders carried, in its day, the traffic of the Northern half of the continent. By it the manufactures of Europe, although not in very large quantity, reached the Rocky Mountains and the shores of the Arctic Seas. Nor did the old fur traders stop there but pushed their way over the Rocky Mountains and established trading posts on the Thompson and the Fraser. They placed ships, too, on the Pacific Ocean which served to carry their rich peltries to the populous shores of Asia, where they found a ready market and whence there came, in return, stores of silks and finery which enchanted the dusky maidens of plain and forest and led to a wonderful increase in the traffic. In the development of recent times history has repeated itself. On the Great Lakes, the fleets of commerce have replaced the birchen skiffs of the old voyageurs and Indians. Railways sweep over the valleys of the Saskatchewan and through the mountains of British Columbia, where the kilted Highlanders of the old Northwest Company so long held sway, and the little vessels which these same Highlanders placed on the Pacific Ocean, have in their stead, the magnificent steamers of the Canadian Pacific Railway Company.

All over the continent as well as on the ocean, the routes by which the fur traders first travelled are becoming the highways of commerce, and it could not be otherwise, for they were quick to discern and prompt to avail themselves of every natural advantage that land or sea presented.

Their main highway from Lake Superior to the prairies was by way of the Kaministiquia and the waters of Rainy River, along the line of communication, further opened soon after the acquisition of the Hudson's Bay Company's rights by Canada and now known as the "Dawson route." It was over this route that the military expedition of a quarter of a century ago was carried and this route, of old so useful, presents the means of forming an available water-way from Lake Superior to Lake Winnipeg into which latter flows the Saskatchewan, a great river already in large part navigable and susceptible of being made so throughout its entire course from Lake Winnipeg to the foot hills of the Rocky Mountains.

Here, then, is a water-way which, before entertaining the idea of expending the resources of the country in deepening the St. Lawrence canals to an extent greater than that at present being provided for or needed, should, to say the least, be very fully considered, for it would, for one thing, be the best feeder to the St. Lawrence canals which, even on a draught of fourteen feet, will have the capacity to carry the traffic of a continent.

It is not wise in the present era of progress to look on such schemes as being chimerical. Our neighbours across the lines have projected a water-way from Lake

Michigan to the Mississippi, which when carried out, as it no doubt will eventually be, for it is even now in process of construction, will have a very marked effect on the traffic of the St. Lawrence and yet, but a few years ago, that project was looked upon as utopian.

The greater part of the route now under consideration has been so often reported on by Engineers and is generally so well known that a very cursory description of it will serve to convey some idea of the difficulties to be met with and overcome in making it an available highway for navigation.

The first question to be considered in all such enterprises is as to the supply of water where a summit between two great river systems has to be crossed, and in this case it may be at once stated that, at the height of land separating the waters running to the St. Lawrence from the streams flowing to Rainy River, on the Dawson route, there is, according to the reports of the engineers, water in sufficient abundance for the supply of a canal of the largest capacity both ways.

Shebandowan Lake, a large sheet of water on the eastern side, differs but little in level from Lac des Milles Lacs, a still more extensive body of water on the western slope, and Kashaboïwe, a smaller lake intervening between the two, is only eight feet higher than Lac des Milles Lacs. There is an extensive plateau of comparatively level country at the water shed. And it is stated in the old reports of the engineers, who first explored the district, that a dam 16 feet in height at the outlet of Shebandowan Lake and low dams at the outlets of Lac des Milles Lacs, with a dam of suitable height in the narrow gorge at the head of French Portage would give an unbroken stretch of navigation, without locks, of 67 miles in length, clear across the height of land. And this stretch, if so made navigable, would as shown by the reports referred to, be supplied by the drainage of 700 square miles of densely wooded country interspersed with deep lakes in a climate, too, of exceptional humidity, so that no apprehension need ever be entertained of the supply of water failing, and this is a favorable circumstance, not often met with at the summit of a water shed separating two great river systems.

This stretch of navigable water would be within forty or forty-five miles of Lake Superior, at its eastern extremity, but whether a canal should be made over this short distance or some other way of cheap freight transportation devised, is a question which may await future consideration. The difference in level is about 850 feet, that is, between Lake Superior and Lac des Mille Lacs.

From Lac des Mille Lacs, westward, the descent is much more gradual, the first considerable drop being at French Portage where there is a fall of 90 feet, followed by about 15 miles of quiet water. Then Deux Rivières Portage, where there is a fall of 120 feet to Sturgeon Lake, but in the next 75 miles to Rainy Lake, the fall is only eighty feet or thereabouts. From the head of Rainy Lake to Rat Portage, at the outlet of the Lake of the Woods, the navigation is unbroken save for the fall at Fort Frances where a lock is in part constructed. Steamers are already in use on Rainy Lake, Rainy River and the Lake of the Woods.

In the whole distance from Lac des Mille Lacs to the Lake of the Woods, there would be no great length of canal at any one place. The navigation would be through deep lakes with short rapids or falls, where locks would be required, between them, except on Rainy River, a stretch of 80 miles, where there is, in some places, a strong current and at one place (the Long Sault) a rapid which requires improvement. Rainy River is a large stream fed by the drainage of 30,000 square miles of territory where the rainfall is such as to have given the river the very appropriate name it bears.

The lake of the Woods is, in round numbers, at an elevation of some 320 feet above Lake Winnipeg, and the distance between the two is, by the Winnipeg River, about 147 miles, but whether it would be better to follow this great River, or strike across from the Lake of the Woods to the Red River, is a question requiring consideration.

The Winnipeg River presents, in its general character, a series of lake expansions, separated by falls and rapids, but in one section, known as the White River or Seven Portages, it is very rough, and at high water is impracticable even to the voyageurs. The waters of the English River and the Winnipeg are here combined, and their united volume, gathered from sixty thousand square miles of territory, pours over the declivities of the Seven Portages in a tumbling sea of foam, hemmed in by rocks.

No engineer would tackle such a place without the resources of a nation at his back. But, fortunately, nature has at this, the worst and wildest part of the Winnipeg, provided a by-route with stretches of river smooth as mill ponds, separated by short rapids, where the construction of locks would be practicable. This by-route is called the Pinawa. It breaks off from the main channel at Otter Falls, some distance above the seven portages, and rejoins it twenty miles lower down at Lac du Bonnet. From Bonnet Portage to the mouth of the Winnipeg at Fort Alexander, there are several falls, and an occasional angry looking rapid, but the difficulties are not insurmountable and, once at Lake Winnipeg, there is smooth sailing for three hundred miles to the mouth of the Saskatchewan, and the Saskatchewan, with occasional intervals of shallow water, where deepening and, perhaps, in some cases, locks might be required, is navigable to vessels of moderate draught to the precincts of the Rocky Mountains. With its numerous navigable branches extending for hundreds of miles through a fine agricultural country, underlaid, as it is reported and proved to be, by inexhaustible coal fields, the improvement of the navigation of this great River of the West, is a matter of the first importance.

But to return to the Lake of the Woods, whether it would be better to go by the Winnipeg River or strike across for a distance of some eighty miles to the Red River at some point at or near the city of Winnipeg, is the question to be considered. The Lake of the Woods, on its west side, at Buffalo Bay, seems to be, as it were, brimming over; the land rises but little above its level and so flat and low is the country

westward that it is said the Indians go across in spring through reedy marshes to the waters of the Roseau which flow to Red River, without once taking their canoes out. Be this as it may, there can be no question, because it is an established fact, that, for about thirty miles to the west of the Lake of the Woods and south of Lac Plat, the country is almost a dead level, with occasional rocky or sandy islands of greater or less extent, rising at intervals, but with low and level ground all round them. The construction of a canal through such a country would be simply a matter of digging and embankment. But, west of the section indicated, there is a very gradual and almost imperceptible slope for a distance of about 35 miles, to the valley of the Red River, across which latter for fifteen miles or so to the Red River, there is no greater difference in the level than a foot or so to the mile. The Lake of the Woods would be the summit level, and source of supply and from thence westward, by avoiding the sandy and rocky islands referred to, there would, first, be a practically dead level country of thirty miles or something near it, then thirty-five miles, or less, of country sloping to the westward with an average descent of not more than six feet to the mile, and lastly a practically level stretch of 15 or 20 miles to the Red River, with but a very slight slope to the west. There are streams on the route which could be used as feeders, but in no case would there be risk from floods, as the surface of the canal would, where necessary, be above the drainage of the adjacent country. At the Lake of the Woods the quantity of water permitted to enter the canal could be easily regulated. So far as known, there would be no rock excavation. Still, it is possible that the horizontal limestones which are supposed to underlie the whole district, may occur near the surface at the divide, a little to the west of the Lake of the Woods, but of this there is no evidence. The rocks which appear in the form of islands in the great flat are of Laurentian Gneiss, but they are isolated with flat ground all about them. It is not claimed for the distances and levels given in the foregoing that they are more than approximately correct. They are sufficiently close, however, to admit of a fair idea being formed as to the practicability of rendering this great water-way available as a channel of transportation.

From the Lake of the Woods to Lake Winnipeg, the choice would be as above set forth, between a great and turbulent river and a cut across to some point on the Red River, at or near the city of Winnipeg. Both routes, from all that has so far been learned, are practicable, but, in all that could lead a country to undertake the great cost of a canal, the preference from a local, as well as a general point of view, must be accorded to the route by the way of the Red River and the city of Winnipeg, even if it should be the most costly, because among other advantages, such as settling up the country and developing its resources, it would be the best. It would, moreover, in this particular section, be a paying investment from the outset. It is needless to point this out further than to say that it would have at the one end the forests of the Rainy River district and at the other the city of Winnipeg with the treeless prairies beyond it, and to anyone familiar with the growing wants

of these prairies in lumber, the magnitude of the traffic which such circumstances alone would occasion must be apparent.

From the city of Winnipeg, by way of the Red River, Lake Winnipeg and the Saskatchewan, to Edmonton, the water-way, as is well known, is susceptible of being made available to steamers of light draught, perhaps stern wheelers, such as are used on the Mississippi.

But, from the city of Winnipeg to Lac Bourbon on the Saskatchewan, the route by way of the Assiniboine and the Manitoba and Winnipegosis Lakes, has its advocates and they claim that it would open a finer country and be more sheltered than the route by Lake Winnipeg. Which of the two would be the less costly is a question for consideration. In the one case the Red River, itself, between the city of Winnipeg and the Stone Fort, would require a good deal of improvement and the grand rapids at the mouth of the Saskatchewan would have to be dealt with, while, in the other, a good deal of canal work would be necessary between the Assiniboine and Lake Manitoba, as well as between the Manitoba and Winnipegosis Lakes where there is a difference of 18 feet in the level, and, again, between the last named Lake and Lac Bourbon, where, although there is no great difference in the level, the excavation would be considerable.

We have thus, west of the Height of Land at Lake Superior, fifteen hundred miles of direct water-way, without reckoning the many branch water-ways which could be made subsidiary to it at no extraordinary cost.

But when all this has been taken into account, there remains to be considered the short section of forty miles between Lake Superior and the waters of the summit plateau. In this section there is enough of water for a canal of any dimensions, and no formidable obstacle in the way of its construction. But the difference in level between Lake Superior and the summit referred to is 850 feet, or thereabout, and such an amount of lockage as would be involved in a distance so short must, for the present, preclude the idea of a canal.

Perhaps a double track railway would afford the most efficient and economical mode of transportation over this short distance, and this break in such a stretch of navigation would be of the less consequence seeing that, in any case, there would have to be trans-shipment at Lake Superior, as the vessels best adapted for the well sheltered inland rivers and lakes would not be suitable for the navigation of such seas as Lakes Superior and Huron.

In drawing attention to the practicability of rendering these inland water-ways available to navigation, I have so far offered no opinion as to the scale that should be adopted in the event of the work being ever undertaken. It is a point requiring much consideration, but, in this regard, I may at once say that canals and locks on such a costly scale as those of the St. Lawrence need not be thought of, inasmuch as they would not be required. From Lake Superior to the head of the Saskatchewan a minimum depth of six feet is probably all that could be obtained, and, certainly,

more than all that could be needed, Vessels drawing far less than six feet are, now-a-days, constructed of a carrying capacity equal to that of large ocean-going vessels, that is, of course, in well sheltered waters, and perhaps a canal system similar to that which has been attended with such wonderful development on the tributaries of the Ohio, and on other rivers of the United States, might be found to be well adapted to the great rivers of the central section of this Dominion. At all events it is deserving of consideration.

The system referred to is in part as follows: Width of channel at surface, 130 feet; depth, 6 feet; locks about 55 feet wide, and of length enough to admit of two steamers being passed at a lockage. In the locks there is stone masonry sufficient to hold the gates securely in place, the space or basin intermediate between the gates being walled in with carefully constructed embankment which answers the purpose as well as masonry. The vessels in use are stern wheel steamers of cheap construction, some of them over 300 feet in length, with as much as 50 feet beam. Their freight carrying power is enormous, and that, too, on a draught of only six feet or less.

To reach some of the coal mines in the mountain passes on the tributaries of the Ohio, great differences of level had to be overcome. Some of the locks built in the early years of the century were of timber, and they lasted with but little repair through many years of constant use.

Thunder Bay, into which flows the Kaministiquia, is practically, and must continue to be, the ocean port of the North-West Territories of the Dominion. Let the water-ways from thence westward be opened up for navigation, as the circumstances of the country will permit of their being so. It is along navigable water courses, all the world over, that population has first taken root. Fertile lands and fuel, within easy reach, ensure its permanence, and these conditions obtain in a marked degree along the great line of water-way which I have endeavoured to sketch out.

JOHN ROSS,
Contractor.

Niagara Falls, Ont.
February, 1895.

