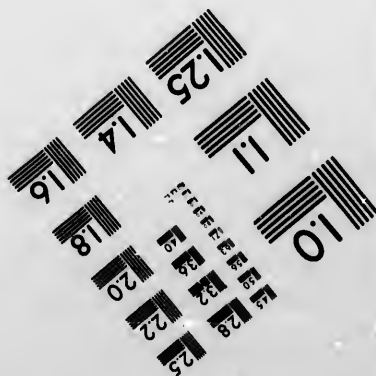
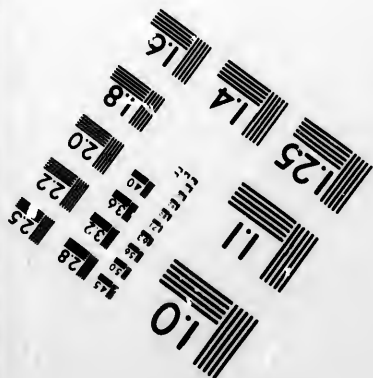
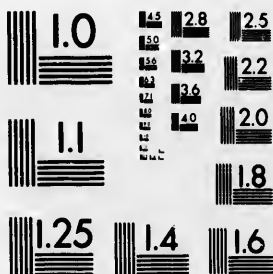


IMAGE EVALUATION
TEST TARGET (MT-3)



2.8
2.5
2.2
2.0

**CIHM/ICMH
Microfiche
Series.**

**CIHM/ICMH
Collection de
microfiches.**

01



Canadian Institute for Historical Microreproductions

Institut canadien de microreproductions historiques

1980

Technical Notes / Notes techniques

The Institute has attempted to obtain the best original copy available for filming. Physical features of this copy which may alter any of the images in the reproduction are checked below.

L'Institut a microfilmé le meilleur exemplaire qu'il lui a été possible de se procurer. Certains défauts susceptibles de nuire à la qualité de la reproduction sont notés ci-dessous.

- | | |
|---|---|
| <input type="checkbox"/> Coloured covers/
Couvertures de couleur | <input type="checkbox"/> Coloured pages/
Pages de couleur |
| <input type="checkbox"/> Coloured maps/
Cartes géographiques en couleur | <input type="checkbox"/> Coloured plates/
Planches en couleur |
| <input type="checkbox"/> Pages discoloured, stained or foxed/
Pages décolorées, tachetées ou piquées | <input checked="" type="checkbox"/> Show through/
Transparence |
| <input type="checkbox"/> Tight binding (may cause shadows or
distortion along interior margin)/
Reliure serré (peut causer de l'ombre ou
de la distortion le long de la marge
intérieure) | <input type="checkbox"/> Pages damaged/
Pages endommagées |
| <input checked="" type="checkbox"/> Additional comments/
Commentaires supplémentaires | Original copy restored and laminated. |
-

Bibliographic Notes / Notes bibliographiques

- | | |
|--|---|
| <input type="checkbox"/> Only edition available/
Seule édition disponible | <input type="checkbox"/> Pagination incorrect/
Erreurs de pagination |
| <input type="checkbox"/> Bound with other material/
Relié avec d'autres documents | <input type="checkbox"/> Pages missing/
Des pages manquent |
| <input type="checkbox"/> Cover title missing/
Le titre de couverture manque | <input type="checkbox"/> Maps missing/
Des cartes géographiques manquent |
| <input type="checkbox"/> Plates missing/
Des planches manquent | |
| <input type="checkbox"/> Additional comments/
Commentaires supplémentaires | |

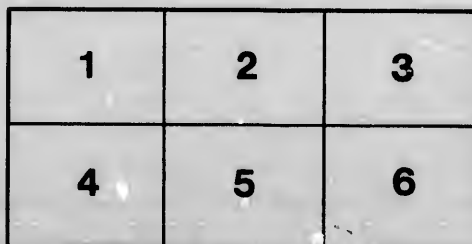
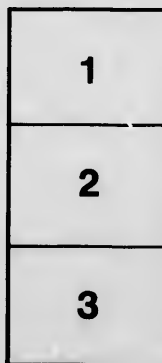
The images appearing here are the best quality possible considering the condition and legibility of the original copy and in keeping with the filming contract specifications.

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

The original copy was borrowed from, and filmed with, the kind consent of the following institution:

Library of the Public
Archives of Canada

Maps or plates 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:



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.

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

L'exemplaire filmé fut reproduit grâce à la générosité de l'établissement prêteur suivant :

La bibliothèque des Archives
publiques du Canada

Les cartes ou les planches trop grandes pour être reproduites en un seul cliché sont filmées à partir de l'angle supérieure gauche, de gauche à droite et de haut en bas, en prenant le nombre d'images nécessaire. Le diagramme suivant illustre la méthode :



THE CORNWALL CANAL.

ITS LOCATION AND CONSTRUCTION.

BREAKS AND PRESENT CONDITION.

A SPEECH

DELIVERED IN THE

HOUSE OF COMMONS,

OTTAWA,

BY

DARBY BERGIN, M.P.

Mr. BERGIN moved for:

Copies of reports, plans and surveys of the then proposed Cornwall Canal by J. B. Mills and Benjamin Wright, Esq's, Civil Engineers, and by Capt. P. Cole, Royal Engineers, in the years 1832, 1833 and 1834; also for survey and report of Colin Carman, Esq., C.E., of a proposed change of location of Cornwall Canal, from Sand Bridge through Hooples' Creek to Archibald's Point, with plans, profile and estimates.

He said: I make this motion for the purpose of bringing before the House and the country the present state of the Cornwall Canal, and the plans proposed for its improvement by the Chief Engineer of Canals. I am aware, that in introducing this motion and in taking the course I propose to take, I am assuming a large responsibility, and that in taking exception to the plans proposed by the chief engineer, I am called upon to substantiate by the records the statements which I propose to make. It will be fresh in your recollection, Sir, and in the recollection of every member of this House, that a serious break took place in the Cornwall Canal, in the month of October last, near the village of Moulinette. This, Sir, was not the first

or only break that has taken place in the Cornwall Canal since it was opened nearly half a century ago. To explain the matter to the House and to the country in a manner that will be satisfactory to them, I shall be obliged to quote largely from the records to show that at no time, since the construction of the canal until to-day, has it been safe for the purposes of navigation. We all know that any serious breach in the Cornwall Canal must be attended with the most disastrous results to the commerce of this country. The last break which occurred, it has been estimated, cost not less than five millions of dollars to this country, and for that reason I feel that it is my duty to bring before Parliament the present state of the canal, the plans which are proposed by the chief engineer, the contracts which have been let, and the alternative nature of the plans which are now before the Government for the prevention of any further such accidents to this canal. No change of location, no plan for the strengthening of the banks, which does not put beyond peradventure any further breach of this kind, is one that can be accepted by the people of this country. The Boards of Trade, the Mariners' Association, the ship-owners, all view with alarm the present proposed plan of improvement, and they are all anxious that the attention of the Government shall be closely directed to the present contracts. The works proposed are, unfortunately, under contract, and it may be objected that, being under contract, we ought to allow the contracts to be carried out. But I, for one, hold—and I am not alone, for the most practical men in this country, and men of high scientific attainments, are of the opinion that the plans are not satisfactory—that they are not plans which will make the Cornwall Canal secure, that they are not plans which will prevent any further interruption to commerce. It must not for a moment be supposed that, in the criticism I am about to make, I am in any way censuring the Government of the country. The Government acts upon the report of its chief engineer, a man of high attainments, of long experience, who for more than a quarter of a century has been advising all the Governments that have held power in this country, and he has held that confidence up to the present. I do not impute to that gentleman any ulterior designs in the plans which he has proposed, but I do say, from all I have been able to learn, from the enquiries I have made, from what has been said to me by practical men and by scientific men, that his plans are not at all what they ought to be. This leads me to say this: that as the plan which he proposes to follow now is the plan which was adopted at

the time of the construction of the canal, commenced in 1834, I am bound to show some reason why that location was adopted, and why the plan to which we seek to revert was not then carried into effect. Professional jealousy was the cause of the abandonment of the first survey and the selection of the second location. Professional jealousy, the same monster, rears its head to-day, and it is for this reason that the Chief Engineer of Canals refuses to listen to the propositions made by other engineers and practical men. Let me read to the House an extract from the address made by Mr. Samuel Keefer, at the meeting of the Canadian Society of Civil Engineers, at Montreal, a few weeks since. He said :

" It has been suggested that some reference should be made to the first construction of the Cornwall Canal, the enlargement of which is now in progress, especially to that portion of it between Moulinette and Mille Roches, where the breaches have occurred, and it is my intention to do so, not in this address but in a paper specially prepared with illustrations, to be read at one of the regular meetings of the society. Having spent nearly six years of my younger days as assistant engineer, under I. B. Mills and Colonel Phillipotts, resident engineers in its construction. I may claim the privilege of contributing the facts in relation to the formation of the banks that have come under my own observation.

" The much, however, may be said here.

" The canal and its banks were constructed of ample dimensions. The canal was 100 feet at bottom and 10 feet deep. The embankment was raised to fourteen feet above canal bottom, and made twelve feet wide at top with slopes on either side of two to one.

" That portion of the canal embankment on the upper reach, which for upwards of a mile in length, from Moulinette to Mille Roches, holds the water in the canal at a level of about twenty feet above the branch of the St. Lawrence, which runs alongside, is in fact founded upon the treacherous clay bottom in which were found springs of water, and in part in side-cutting permeated by streaks of sand. The embankment over this ground was formed with extra care, the earth being laid on in courses with carts, and where the outer slope ran out into the river it was protected by boulder stones along its outer edge. Where springs were found under the seat of the embankment they were led out to the river's edge by French drains, and where the streaks of sand were encountered in the side-cutting they were cut off by puddle trenches, six feet deep or more, and the bottom and side bank lined with puddle three feet thick from the puddle trench to high-water mark. This mode of protection was not continuous over the whole line, but was confined to such parts of the bank only as appeared to require it.

" Since the opening of the canal, there have been several breaches in this bank, the last and worst of all was the breach of last fall, which inflicted such serious damage upon the trade of the St. Lawrence last year."

It will be evident from that statement that the greatest care and prudence should be exercised before the Government undertake to carry out the work under the plans proposed by Mr. Page. The fullest evidence should be presented by him to the Government to show that a different condition of the banks can be brought about by the proposed plans, and a different condition of the foundations. I may say that in

1826 a survey, with a view to the construction of a canal from the Long Sault to Cornwall, was made by Mr. Clewes, a very eminent man, who had devoted the greater portion of his life to the study of the rise and fall of the waters of the great lakes, and to the condition of the St. Lawrence. That gentleman published a great number of pamphlets in connection with the subject, and he attained so high a reputation that he was called upon to make this survey and report to the Parliament of Upper Canada. In 1830, four years after, Mr. Barrett, also an eminent engineer, and with whom I had many conversations on this subject in my younger days when he was employed on the Lachine Canal, also made a report, and it was confidently expected by everyone that when the construction of the canal was undertaken, although it was of larger dimensions than the canal on which Mr. Clewes was asked to report, and Mr. Barrett also, the plan suggested by Mr. Clewes would have been adopted. Unfortunately, the commissioners appointed by the Parliament of Upper Canada to construct the Cornwall Canal did not feel they could employ Mr. Clewes or act entirely upon his judgment, or on that of Mr. Barrett. Those engineers were Canadians, and the commissioners sent one of their number to the United States to employ American engineers, not that they had any desire to throw any doubt whatever on the scientific attainments of Mr. Clewes and Mr. Barrett, but because they believed American engineers would have had more practical experience in the construction of canals. The result was not at all what we could have wished, as I shall show by the records which I shall read presently. They obtained the services of Mr. Mills and of Judge Wright, who was at that time Chief Engineer of the Erie Canal. Those gentlemen, on their arrival in this country, entered upon an investigation of the works that were proposed. They felt, coming as they did from the United States, that it was necessary to their professional reputation to show that the Canadian gentlemen, who were employed to make the surveys and report upon them and locate the canal, did not possess skill and scientific attainments equal to their own and were not as capable of suggesting a canal route and a cheap and proper mode of construction, and as a consequence they reported a different plan. I quote from Mr. Mill's report. He says:

"It is well known to the members of the board that two separate and distinct surveys had been made over the same ground in general, and for the same object, upon a smaller scale—one by Mr. Clewes, in 1826, the other by Mr. Barrett, in 1830. As neither of these plans contemplated a canal of more than 8 feet depth of water, and only 60 feet width on the bottom, and locks of 40 feet in width and 132 feet in length; they

did not conform in capacity in any respect to the terms of the Act under which this examination was directed to be made, and were of little use to me in the duties assigned."

Mr. Mills then made an estimate of his plan, as well as an estimate of the plan of Mr. Clowes. The plan of Mr. Clowes, I may mention, was to cut through Archibald's Point about a mile and a quarter further west than the present entrance to the canal, go through Hooples' Creek to a deep ravine and low ground which runs from the head of the Long Sault to Brownell's Bay, now called Sand Bridge, and at Brownell's Bay, or near the head of Sheik's Island, to construct a short dam, the river there being at summer level only about 150 feet from the present canal bank to the head of the island, and never at any time having more than two feet of water. That is called a branch of the river, but it is really not that. Oftentimes during the summer one can walk almost dryshod from the main shore to the head of Sheik's Island. He contemplated also placing a large dam at the foot of the island. This would have given us an inland canal with natural banks that could never break away; but Mr. Mills, in making his report, condemned that plan, as I shall show you presently, because he said it would cost thirty thousand pounds sterling more than the plan which he proposed, and which was to build along the bank of the river and not to have an inland canal. Further on, I will show you from the report that Mr. Mills was obliged to shift his banks over and over again; that he was obliged to shift his centre line fifty feet into the bank; and, finding that the bank was constantly slipping into the river as fast as constructed, so bad was the foundation, and in order to keep it from further danger, he was again obliged to shift his centre line twenty feet further. He then got into a bank of hard pan and boulders, which cost a large amount of money, and, although the bank is to-day within the natural bank, yet the foundation is the same bad, unsubstantial foundation tapped by quicksand and by running water that it was fifty years ago, and it is not in any better condition to-day to build a bank upon than it was then. The very fact of this bank breaking away last fall, as it was always predicted that it would break away, and as Mr. Mills himself, after two years of construction had been gone on with, admitted it would break away, shows that it is time we should direct the attention of the Government (whose attention was never directed to it before) and the attention of the Chief Engineer of Canals, to the actual state of the facts. Mr. Mills, in making his estimate, says this:

"Thence to Archibald's Point, distance $3\frac{1}{2}$ miles, the natural channel of the river presents no impediments to the navigation of steam-boats of the class contemplated to be used; in truth, this is the most placid part of the stream from Prescott to Cornwall. I come now, Sir, to the point, Archibald's, where it has been proposed to leave the river, in order to pass the Long Sault. As the Canadian channel of this rapid does not afford a safe or convenient passage, even for descending boats, it becomes necessary to construct a canal to accommodate both ascending and descending trade. Therefore my calculations from said point to Cornwall, are based upon a canal of 100 feet width at bottom, and banks sloping according to a base of 2 feet to 1 foot vertical. From this point to Cornwall, $11\frac{1}{2}$ miles, several plans have been suggested and considered, only two of which have been deemed worthy of particular examination. Mr. Clewes proposed cutting across said point and passing up the valley of Hooples' Creek, $\frac{3}{4}$ mile; thence following a depression of the country, and dropping into the stream at Brownell's Bay. See plan No. 1 of this work. This plan I have examined, and have prepared minute calculations of its cost.

"The other plan examined, is to follow the river and its shore to the same point. I will now, Sir, compare these two routes or plans, to their union at Brownell's Bay. The route by Hooples' Creek, is three miles and 72 chains, in the course of which there occurs 1,461,000 yards excavation.

"The river route follows the natural channel of the river, which affords a good and easy navigation one and a quarter miles further down; thence I make a canal on the bank of the river to the said bay, distance two miles and 44 chains."

The point I wish to make with regard to this proposal and this report of Mr. Mills is, that his estimate of the number of yards of excavation was made for a channel 10 feet deep, and that, singular to say, the estimate which is made to-day for a channel 16 feet deep, through precisely the same ground calls but for one hundred or two hundred thousand yards more. The inference is plain that Mr. Mills purposely over-estimated the expenditure upon that proposed plan, in order that his plan might be adopted. Here is what he says:

"You will perceive Sir, by the above comparison, that there is little difference in distance (counting the distance on the river from said point to the commencement of the river work $1\frac{1}{4}$ mile), but that there is $1\frac{1}{4}$ mile less distance to be improved, therefore less distance to keep in repair, and also that there is \$122,618.89 in favor of the river route."

I have shown you, Sir, the reason why Mr. Mills adopted that plan, and I propose to show you how, as the construction went on, every day developed the inaccuracies and the utter want of safety in that plan as proposed. The commissioners appointed by the Parliament of Upper Canada were not satisfied with the plan proposed by Mr. Mills, nor were they satisfied with his estimates or his location, and they asked His Excellency, Sir John Colborne, to lend them the assistance of Captain Cole, then at the head of the Royal Engineers in this country, and they consulted also Mr. Fleming, an engineer of repute, and Mr. Thomp

son, and asked them to report upon the plan of Mr. Mills, and particularly to report on the Hooples' Creek and Brownell's Bay route, that the utmost caution and circumspection should be observed before deciding upon the route. I propose to read to you, Sir, what Captain Cole said—and there can be no higher authority—upon that portion of the work which the present Chief Engineer of Canals to-day pool-poohs:

"In altering their plan to meet the wishes of the country, Judge Wright and Mr. Mills stated that they were aware of the greater cost of No. 1 (the inland route), but preferred the latter as a more perfect work. The latter gentlemen thought the saving might be £30,000. I imagine that this will be found under the mark, but nothing certain can be given until a survey of the points to be improved has been made. The first and principal feature of the natural course about to be adopted, is the damming below Brownell's Bay. Having given the subject such consideration as imperfect accounts of the localities, and Mr. Ridout's map of Canada, enabled me to give, before I visited the spot, I concluded that we might construct these works advantageously, and I found the reality greatly surpassing my expectations. If an embankment be thrown across the passage above Brownell's Bay to Sheik's Island, the water lock may be finished without pumping, and the dams below constructed without the usual expense of an artificial waste weir, or the shifting of a temporary one in the dam itself as the work progressed. The water being thrown around the outer channel by this embankment, no difficulties remained to contend with. This bank, I advise, should be permanent, with a masonry waste weir of sufficient dimensions to feed the locks and mills, with a spur or jetty thrown forwards (as at present from the wooden lock) to catch the upper level of rapid as it passes at right angles across the mouth of the passage. This difference of level is about two feet. The extra expense of making this work permanent would scarcely exceed that of a temporary coffer-dam, independent of the masonry checks of the sluice-way—and a guard of three or four feet against the spring floods would be much less costly than the same guard placed on the dam and lock at Moulinette. The advantage would be acquired of relieving the works below at any time, in case of leak in the dam or lock, which may be required in spite of all previous care of the engineers, from the carelessness of the contractor, or from some defect in the lock itself which would require remedy; much, it is true, may be done by previous care in the foundation of dams, and the examination of the rock under them and the locks—all apparent fissures being filled with cement and covered with a little masonry. The advantage, also, will be given by the bank above, of letting in water by degrees and watching the effect produced, so that all defects may be remedied before the navigation opens. The backing might also be allowed some time to consolidate before the water is let in. This work I call embankment because it does not raise the level of the water, but merely retains it at the level required. All these details, and many more, will better be known to the resident engineer. I will merely state, that the masonry of dams should be arched key work, well wedged up; this saves extra masonry, and if well performed, there is no use in mortar or cement being added, but broken stones and shingle should in either case be placed about 4 feet thick on the back of masonry to prevent the passage of the gravel and clay of the slope above. The water should not run over, for several reasons, and a guard of 2 feet will be ample against the wash of the surface water. All these arrangements were concurred in by the engineer, and from hence downwards, no discrepancy of opinion appeared; all details being left to the judgment of the resident engineer, including the formation of sluices at each dam."

Now, one would suppose, as Capt. Cole evidently supposed, that this proposition of his would have been carried out; but it was not. Mr. Geddes, who was also consulted by the engineers, speaks of this plan, too. He says:

"The lower level leaves the upper, by locking down 17 feet to the surface of Brownell's Bay: said bay being raised $5\frac{1}{2}$ feet by a dam at Mille Roches, holding up the water 13 feet above its present surface at that place, thus producing a depth of 10 feet water through the bay.

"The artificial lake thus produced, would afford a fine piece of navigation for three miles, but destroy the valuable water power of Moulinette, and what is more serious, produce, in the canal line to be carried from Mille Roches onward in much of the distance for the first three-quarters of a mile, cutting 17 feet deeper than by pursuing the upper level, beyond which there is 9 feet between the two levels.

"Few localities equal this in the facility of making said dam, or founding a water lock, at the head of Brownell's Bay: a low embankment shuts all the water from the north side at Sheik's Island, leaving dry land to build the water lock on at the head of Brownell's Bay, and the dam at Mille Roches. This embankment at the head of Sheik's Island, Mr. Mills values at but \$150; a canal from the head of Brownell's Bay to Mille Roches he estimates at \$103,980.

"The value of three miles of an artificial lake, instead of a canal, would be the set-off against some excess of expense which probably will be incurred by following the lower level."

Mr. Floming also reported in the same way. He says:

"On considering the first of these, namely, an entire canal, as now laid down by the engineers mentioned, it appears to me to have been adopted under the impression of avoiding apprehended hazard from ice to any works which might be placed in the river between Brownell's Bay and Mille Roches, for, on the left bank of this branch of the river, the canal route is necessarily very circuitous, and would be expensive to construct from the steepness and the brokenness of the ground, whereon much deep side-cutting with heavy embankments must be made towards the river, for the level of the base of the canal must be from 13 to 23 feet above the surface of the river, which, in consideration of the magnitude of the canal proposed, becomes the more hazardous in point of stability by being thus supported by new embankments. At the upper side of Mille Roches village, the same route leaves the bank of the river and proceeds about one mile further on the same level to the first lock. On the last part the cutting is very deep, and through a soil of a quality, as indicated by several places here, much disposed to slip, and which may require, I would fear, somewhat more than the estimated expense, although this might be sufficient to accomplish the same quantity of excavation of better ground. The continuation of this route to its debouche into the St. Lawrence presents nothing remarkable but the deterioration of the lands and the town of Cornwall, which it passes through.

"Such being the features of this proposed route of an entire canal, I regard that part of it which extends from Brownell's Bay to Mille Roches as unnecessary and expensive, and which, in my opinion, should be entirely superseded, by adopting the river here in its stead, which brings me to consider the second route mentioned above.

"It now will appear on this route, there would be a great saving in expense by the mere construction of the dam proposed at Mille Roches, instead of forming a canal along the bank of the magnitude proposed. As additional to this dam is only required a stop gate in the entrance here of the canal. It would also be advisable to throw a dam of small height across the stream at a point above the position of the lock at Brownell's Bay, by which the waters from the Long Sault may be

always regulated or occasionally absolutely stopped. The means of doing the latter would afford the dam at Mille Roches to be built on almost a dry foundation, and also the same for the locks at Brownell's Bay, which also would allow to remove any shallowness or impediments of the channel. Pauls or buoys may be afterwards placed to direct the course of deep water.

"As the proposed part of this new route, on the canal, is not yet surveyed, the expense of it must remain undetermined. Until this is done, however, it is clear this proposed alteration of route, from Brownell's Bay, would afford a much better steamboat navigation than an entire canal, and which would be, evidently, many thousand pounds less expensive; also, if well constructed in the dams and locks, the whole would require little annual repairs; besides, this reach upon the river would afford a safe protection for vessels to lay up in the winter months, for the dam here would form a barrier against all movements which might hereafter happen from obstruction of the ice below, and with a very ordinary dam above the works at Brownell's Bay, there could be no danger apprehended on this side, and this last dam would regulate the supply of water as required for the head basin, as well as for mill purposes, which then might be properly afforded from the dam at Mille Roches.

"Thus far I would decidedly recommend these alterations as superior, both in respect of utility in navigation and towards reducing the whole expense to that of an entire route, as proposed by Messrs. Wright and Mills."

Mr. Mills made a second report, in which he partially admitted all the objections which were made by the other engineers to be correct. He said:

"As such operations in large streams ever leave marks of their effects, I presumed they were to be found along the banks of the river. Accordingly I observed such effects as the tearing up, breaking and scarifying of trees, and concluded that the accounts might be half true, and if so, there was good reason for keeping as clear of exposure as possible in the construction of the works in contemplation. Floods, though free from ice, when they deluge a line of canal with earthen banks, ever cause great derangement and expense of repairs, and it is generally considered by men conversant with matters of the kind in question that such works ought not to be exposed to the danger and hazard of inundation. Thus I view the subject, Sir, and accordingly, I acted. As in the course of the past year, I am not aware of any important change in the laws of nature or in the consequences of their operations, I am to presume that the danger of exposing works of the kind in question is as great to-day as it was one year ago—therefore I have not seen any reasons for taking a different view of the said plans and locations."

And yet, admitting the danger that would certainly follow from inundation and from the rapid rush of water at particular seasons, he nevertheless persisted in following out the original plan and location; and when I come to read to you, as I shall after a little while, the report of Mr. Page, Chief Engineer of Canals, made the other day, you will find he attributes the destruction of this bank to the causes laid down by Mr. Mills in this report. He refers again to what evidently was a painful subject to him, Clewes' and Barrett's plan. He, somehow or other, was unable to rid himself of that, and on every occasion in which he got into

difficulty, he endeavored to convince himself against his better judgment that the plans he had rejected in the first instance were the plans he ought to have followed. He says, although there was no necessity for him to refer to any other plans at that time :

"I wish briefly to refer to three plans that have been considered and, I believe, abandoned :

"1. The one proposed involving a dam of the St. Lawrence at Point Maligne, near Cornwall. This plan, I believe, is abandoned, not, however, because of its impracticability, but rather from its inexpediency, all things considered.

"2. Passing Long Sault by the original route—then dropping into Brownell's Bay, raised five or six feet by a dam at Mille Roches—thence passing the original line nearly, and reduced seventeen feet to Cornwall, I have made an estimate of the expense of this plan of improvement and find it costs about £4,000 more than the plan recommended to your board last year."

And with him £4,000 extra expenditure was not for a moment to be considered in connection with the safety of the canal, and the disastrous results that might at any time ensue, interrupting navigation and greatly injuring commerce.

"4th Plan. Drop into Brownell's Bay, raised five or six feet by a dam at Moulinette. At Moulinette drop into a pond made by a dam at Mille Roches. At Mille Roches drop into the river at the foot of the fall at this place; thence pursuing the river to French's Rift, through which cut, and drop into the river below it; thence following the river to Point Maligne, through which cut, and drop into the Cornwall Bay, where terminates the improvement. This plan, you may know, is not altogether new. At least it is as old as the spring of 1833, most of which was proposed to me by several persons at that time, and all of which has been more or less considered by me in the course of my surveys in reference to this improvement. However, it does not receive from me so much serious consideration, for the reasons which I have above stated. I believe this plan is thought well of by at least two of the gentlemen who have recently visited the ground. I am very decided in the opinion that it is the best plan, if the original one is to be departed from, and the levels reduced—therefore I determined to furnish the board with an estimate of the expense of it at this time. In the interval of the departure of the gentlemen who have visited us and the meeting of the Board of Commissioners there was not time for a minute survey with direct reference to this improvement."

Here we have an admission from the man on whose advice the canal was located, that the plan of Mr. Cewes was the best and proper plan, and we have the admission, a little further on, that because of a comparatively trifling expense of \$102,182, which the construction of a canal that would be safe for all time would cost, he abandoned the old and stuck to his own plan, which he admitted was not the good or the proper plan. In considering his plans I have brought you as far as Moulinette and Mille Roches, for by that time he had realised that he had made a tremendous engineering blunder; and after a large sum of money had been expended

he abandoned his proposed plan of a river canal from French's Rift to Corwall, and insisted upon the construction of that portion of the canal by the inland route. Fortunate it was for Canada that he had the good sense to abandon even that much of his proposed river canal. Those who knew Mr. Mills, those who have any knowledge of the public works that he constructed, will tell you that he had a weakness for following the sinuosities of the river and building all his improvements upon its banks or as near to the banks as possible, his desire being to show that by superior engineering skill he could overcome natural difficulties in a way they could be overcome by no other engineer; and owing to the overweening self-conceit of this engineer, the commerce of the country has been imperilled and actually stopped more than once, with the disastrous result which we all know followed the break in October last. In the subsequent report, Mr. Mills made the usual statement which he made every year during the progress of the construction of the canal:

"Although I have no doubt of the safety or permanence of the work."

Now, why should he, above all men, refer to the safety or the permanence of the work, if he did not feel in his heart of hearts that the work was not safe or permanent, and it could never be made so on the plan he had laid down. His consulting engineer, Mr. Wright, also had the same bogey before him at all times, and he too felt called upon, because of the reports which were made to the commissioners by the assistant engineer every month, to insist upon the safety and the solidity of the work. Speaking of that section of the canal, notwithstanding what the Chief Engineer of Canals may say, and notwithstanding what those who are wedded to his opinions may say—for I have heard one or two engineers say that they think that portion of the canal from the guard lock to Brownell's Bay may be made safe—notwithstanding what they say, I shall be able to show from the reports that that portion of the bank is built upon a bad foundation, that it was improperly constructed at the beginning, and is to-day in a most unsatisfactory condition, and at any day may be swept into the river. This is what he said about section No. 1:

"From the first, and throughout the whole course of my duties in the service of your board, economy, permanency, and despatch, so far as they are relatively consistent, have been grand objects to which my attention has been directed; and in any proposition relative to construction, wherein plans are projected or changed, the above considerations have been in view, and they were in full view, when I proposed said piers on section No. 1. The following is simply the circumstance in which the suggestion originated: In prosecuting the work along a sec.

tion of the upper part of this contract, I observed that an important portion of the earth thrown into the river was taken away by the current, which is made serious by a shoal jutting out from the opposite shore, which has formed the channel bold on the north shore for about 2,000 feet. It became an object with me to counteract this current and throw it from the shore, by which I would not only save all the material carried out by forming a permanent protection against the abrasion and action of the river, but would be enabled to carry the bank farther into the river even than the original plan contemplated, thereby reducing the amount of excavation to an extent that the cost of the piers, even at double the estimate, would be much more than compensated, and the work finally more secure. That this would be the result I have no doubt."

But the result did not prove to be so. Notwithstanding that he had no doubt in regard to it, in the course of a few months, he was obliged to remove his centre line 50 feet into the bank, which was composed of boulders and hardpan; and, two years after, he was obliged to move it 20 feet further into the shore in order to save his bank. There can be no doubt that Mr. Wright, the consulting engineer, was thoroughly aware of the dangerous state of the bank, and of the effect which the ice and a rapid current, in case of flood, would produce. I need only refer to his report to the commissioners in June, 1835, after the bank had been carried away by the force of the river. On the 1st November, 1836, at the close of the season's work, Mr. Jones, the commissioner, who reported that Mr. Harvie's section No. 1—the most dangerous section, as I contend, now—had to be changed because of the slipping away of the banks, the quicksands, and the shifting sands, through which the water permeated from the river into the works, recommended puddle banks. Not only did the water permeate from the canal when there was water enough in it, but it oozed through between the natural bank and the artificial bank from the river, and thousands and thousands of dollars were thrown away in the attempt to make that a safe bank, which never ought to have been constructed there at all. Col. Philpotts, who was appointed after the failure of Mr. Mills, to satisfy the commissioners that he could construct it in an efficient manner and make it permanent, undertook to perform the work by puddling. I have it on the testimony of men who were connected with the construction of that canal, men who are living to day and know of what they speak, that the puddle was made of the poorest material, that Col. Philpotts was not able to get the proper sort of clay to make the puddle, and that the puddle was put on the top of quicksands which should have been removed before the puddle was employed. Col. Philpotts, in all his reports, was obliged to say that the condition of the ground upon which the banks were raised was bad; he was obliged to say that

there were hidden springs in the bottom of the canal which permeated through the work, and that there were quick-sands there, but he hoped to save the work by the measures he was taking and by the paddling with which he was endeavoring to stop the leaks. Now, I come to the report of Mr. Page upon the proposed work, the only one which he has made since 1874, and I propose to deal with that report in the plainest possible terms, because I think we cannot put too clearly or too forcibly before the Government and the country the weakness of the present banks of the Cornwall Canal, and their insecurity. What this country demands is not a cheap work or a work of questionable safety, but a work that shall be perfectly safe and afford perfect security, a canal that will last during all time, and I maintain that this canal can be so constructed and can be made safe for all time at an expenditure no larger, if not less, than is now proposed by the Chief Engineer of Railways and Canals. I have Mr. Page's report, which was laid on the Table the other day, in regard to a portion of this work, in regard to the dams which were approved by Capt. Cole in the year 1835, and also approved by Mr. Geddes, Mr. Thompson and other engineers, and, a few weeks since, revived by Mr. Keefer. But, before touching on that report, I propose to read a portion of a letter without which that report would never have been made, and the Government would never have been advised as to the insecurity of the canal. It is a letter written by Mr. Samuel Keefer, who was engaged as assistant engineer in the construction of the canal, a man whose reputation as an engineer stands second to none, a man whose ability cannot be placed below that of even the chief engineer himself. This letter was addressed to the Minister of Railways, who very properly submitted it to the chief engineer. In that letter he says :

"In these troublous times, I can well understand how the great affairs of State demand your most earnest attention, and for fear of inopportune intrusion, I have hitherto refrained from reminding you of a matter of detail which just now is giving no little trouble and anxiety to those engaged in commerce ; but I feel that I must discharge my Canadian conscience of its duty by reminding you of my views for the enlargement of the Cornwall Canal, as set forth in my letter addressed to you on the 17th February, 1835. My main object in suggesting the plan I did was to provide against disaster of the kind under which the navigation is now stopped by the breach near Mille Roches. I am informed it is the intention of your department to enlarge the upper reach of the old canal, *in situ*, following its sinuosities over the same treacherous ground. If such plan is persisted in, I think you may look for more serious breaches and stoppages after the enlargement than have happened before it, for the reasons I have pointed out, and, if the volume of trade by the St. Lawrence ever reaches the magnitude expected, every stoppage of the traffic must be felt with tenfold severity."

Now, the plan that Mr. Keefer proposed to the Government in that letter in the month of October last, is the same plan which I brought before the Government about ten years ago. I laid the matter personally before the present Prime Minister and Sir Charles Tupper, who was then Minister of Railways and Canals, and he ordered a survey to be made; but, although that survey was made, and an estimate was made of the cost, just about the time Sir Charles Tupper resigned his position as chief of that department, no report was made by the chief engineer to the Government, so as to enable them to act intelligently upon it. He contented himself with verbally saying to Sir Charles Tupper's successor, that the plan was a ridiculous one, and would not give a greater head of water. We did not ask for it in order to get a greater head of water, but because it would enable a larger volume of water to be brought into the canal for the purposes of manufacture and navigation. If that plan had been acted upon, it does not require that a man should be a sage to be able to inform this House that no such accident as that which happened the other day, could possibly have happened to the canal. I shall deal now with Mr. Page's objection to the plan proposed of an inland canal from the head of the canal to Mille Roches. In his report dated the 27th of February last, he says :

"When the work of enlarging and deepening it was placed under contract, provision was made that the widening might be done on either side that would be most likely to improve the line, that is to say, that although the widening was intended to be done principally on the north side of the present channel, it was thought that some salient or prominent points could, with advantage to the general line, be in part removed. The material excavated in widening and deepening the prism, was, of course, to be placed on the south or river side of those places where the banks of the canal are close to the margin of the river."

Here the Chief Engineer of Canals admits that he proposed tampering with the north side of the bank of the canal, to remove portions of it, and throw it over to the south side with a view of deepening the canal, yet, in the next paragraph he is obliged to admit that it would not be safe or prudent for him to do it, but that he must take the north side of the canal on the shore line. Speaking of the break, he says :

"The casualty above mentioned, and the information subsequently obtained, have, however, shown that it would be injudicious to cut into the north or canal side of the south or river bank, consequently the widening must be done wholly on the north or landward side, and the line of the south bank allowed to remain undisturbed, and the slope on the canal side continued down to the new bottom line at the same angle as at present."

And yet, Sir, it seems to me a curious sort of mental obliquity on the part of the Chief Engineer of Canals who could recommend that the north portion of the south bank should be taken away, and almost in the next paragraph admit that if he did so the bank would be destroyed, and recommending that the enlargement must be made from the north side. It is quite evident that he knew himself that the proposal he made, that the contract he let, was upon false promises, and could not be safely carried out. He says :

“ This conclusion has been arrived at by ascertaining from some of the old contracts how the banks of the St. Lawrence Canals were intended to be formed, and it is unlikely that they would be made much different from the manner therein described, which is as follows:—All the best earth for making tight banks must be placed in the front or middle part of the same, that of inferior quality in rear. In forming the bank, the earth, if carried by carts, must be laid in courses not exceeding 12 inches, and all the best material must be placed in the front or middle of the bank. The information received from various reliable sources leads to the impression that certain precautionary measures were adopted in preparing the seats for some of the banks ; all of them were, however, no doubt formed as above stated.”

Now, the chief engineer is incorrect. That bank of which I have spoken, from the present guard-lock called now the head of the canal to Brownell's Bay, was constructed, not with carts, the greater portion of it, but with hand barrows. The earth was deposited transversely to the bank by the laborers, and so soon as the bank had risen to a height over which they could no longer dump the earth from the barrows, they laid down inch boards across the bank, and the boards were laid down so that the barrows might not sink into the soft clay, and that the men might be enabled to wheel their loads easily. What was the result? Every three feet of bank formed a sluice-way? The result of the construction was, when they abandoned the barrows, and the boards were split and of no further use, they were allowed to remain there, and to-day this part of the bank of the Cornwall Canal and during all these years, has been tapped by the sluice-ways which act as channels for the water, sucking it in and sucking it out, to the destruction of the bank. This is not a matter of which the chief engineer can be ignorant, because I have it from the superintendent of the canal on more than one occasion, that in repairing the banks they have come upon portions of the old boards and planks, and although there was better material on the face of the bank, the part of the bank which was constructed with carts was constructed of good and durable material. The core of the bank, which ought to have been made of the best material, and the southern portion of the bank, that which is

along the river, was made of the poorest material, anything that they could get; but they put on the inside, to keep the water in the canal, a face of 8 feet of the best material they could get, and that they made with carts and laid longitudinally. It is now a little more than half a century ago since the Cornwall Canal was constructed. During a great many years that sound, good face which was put on with carts saved the rotten outer banks of the canal, and prevented their being carried away; but after half a century, the wind, the sleet, the snow, the agitation of the banks of the canal by vessels going through, and by the natural wear and tear, this eight feet of good bank has been obliterated, and there is not to-day six inches of good face on the whole length of that canal from the head of the Sault to Mille Roches. And we are asked, Sir, to admit that a sound, and safe, and proper bank could be made by taking the soft material from the bottom of this canal by dredges and lifting it with derricks and throwing it over to the outside of the river; and we are told that any plan that we shall adopt in opposition to this, will cost a very much larger sum of money. Before I get through I shall be able to show you that the estimates prepared by the chief engineer, that the contracts which he has entered into, form but a small portion of the expense that will be necessary for the safety of the canal under the plan that he proposes, and I shall show it from his own reports. He says:

"For two miles along the bank of the Sault Rapids, the soil is of strong clay and gravel, with stone and boulders imbedded in it, and is admirably adapted for making a strong and permanent embankment between the canal and the swift current of the river, the outer edge of which is well protected by the boulder stones taken out of the excavation of the canal."

This, he said, is Mr. Keefer's opinion. Mr. Keefer was not employed on that portion of the canal, and he spoke from memory, but Mr. Keefer nowhere said that the foundation upon which that bank was built was a safe and a proper foundation. On the contrary, we have the evidence of Col. Philpotts, of Mr. Mills, and of Mr. Wright, that this section No. 1 was the most difficult of the canal, because of its shifting sands, its hidden springs, and the shelving bottom. He objects to the plans which are proposed for dams across the head and foot of the canal, and says:

"It is not stated whether it is contemplated to place the dams at the narrowest part of the 'Sny' and use the present towing path with a bridge over each of the openings of the channel; or to place the dams obliquely, and in a position that would make them correspond as nearly as possible with the line of those parts of the island and canal bank with which they connect."

Well, Sir, I would have supposed that, after the long experience of the Chief Engineer of Canals, he would not at this time of day, tell us that it was necessary to have a towpath by which to tow the immense vessels we are going to have through 14 feet of water, so soon as this work is built, by horses along the bank. He must know that the day for towing vessels by horses in a 14-foot channel, is past; he must know that the plan which was proposed by these eminent engineers years ago, is a plan which most effectually forbade anything like a tow path, and, therefore, the objection which he makes on that score, is one which ought not to be entertained for a moment.

"The shore along the north side of Sheik's Island has a very tortuous and irregular outline, so that to make anything like a suitable towing path along it would be attended with a vast deal of uncertainty besides expense; still were this not done in the case of making the "Sny" the navigable channel, a swing bridge would be required for canal purposes over each of the openings made in the bank, instead of one swing bridge for public travel across the canal at Moulinette."

I do not remember when I have read anything more disingenuous. If the dams are built, and in wording this paragraph he presupposes they are built, no bridge is necessary. Anyone who may desire to visit that island, the inhabitants of the island, coming to the main shore, would cross upon the tops of the dams from either end, and no bridge would be required, and the fine road along the island would be used by them. Probably the best road in the township of Cornwall is that on the north shore of Sheik's Island, and no bridge whatever would be necessary. In that connection let me say, that the plan Mr. Page sends down in connection with these proposed dams is a plan more misleading than calculated to give reliable information to the Government, to members of the House and the country. He lays down water lines as if that island were flooded. It is true that in one or two places where the banks are shelving, the water may come up on the shore a little distance, but a small bank of not over three feet high in any place, and not extending an entire length of more than 200 or 300 feet, would prevent one drop of water at the highest known flood injuring any portion of the island. The chief engineer proceeds:

"Having already stated how it is proposed to enlarge and deepen the present canal and the manner in which the material excavated is intended to be disposed of, namely, to strengthen the weakest and least secure parts of the present banks or those parts of them that are closest to the margin of the river, the aggregate extent of which, there is good reason to believe, is less than one-third of the whole distance, or less than three times the length of the two dams that would be required to connect Sheik's Island with the banks of the canal."

Well, Mr. Page, the chief engineer, when he penned that paragraph, must have reckoned on an entire want of knowledge by the Government, owing to his having concealed from them the true state of affairs, and he must have reckoned on their lack of knowledge in regard to the condition of the banks when he said that three times the length of the dams is the whole distance. Why, the length of the bank that is unsound, and which he cannot make safe by the plan he proposes, is between four and five miles, and the length of the dams which we ask him to construct so as to give us a free inland canal, safe at all times and which will furnish water for navigation and for manufacturing purposes, is as follows: One of about 300 feet and another of 600 feet, or altogether 900 feet, as against the distance of five miles. And we must not forget that the construction of those two dams would give us an inland lake over 15,000 feet long, with a depth at the head of not less than 18 feet and at the foot of 43 feet, an average depth of 34 feet and 1,200 feet wide. Is that not a desirable object to be attained, although Mr. Page says it would be six miles away from the foot of the Cornwall Canal. That is true; but the construction of that dam would give an unlimited water power in the village of Old Mille Roches. It would furnish power for many manufacturing establishments and would give employment to many thousands of hands, whereas to-day very frequently the mills in Cornwall are stopped for lack of water in the canal. Speaking of the water in the canal, let me point out to the Government the dangers of the tortuous entry to that canal. There could be nothing worse. Vessels frequently go against the piers and their cargoes are injured or lost. And we are to be told by the chief engineer of this country that we must construct the canal where defective, and that we must retain the same unsafe and unsatisfactory entrance? Let me call the attention of the Government to the change it is proposed to make in the construction of the canal. We say, and we say it advisedly, and I shall be able to prove it if the best engineering talent be consulted, that Lock 19 should not be put under contract at all, but the head of the canal should be placed at Lock 20 instead of at the head of the Long Sault. Instead of taking vessels through lock after lock and consuming, as they do, from ten to twelve hours in passing from the head to the foot of the canal, by the plan proposed, which will make the canal safe, and so that it can never break away, we shall reduce the time consumed in passing from ten to twelve hours down to four to six hours. Is not this an important matter to be considered in the

interests of the trade and commerce and navigation of this country, that we should not only minimise the expenses of transport, but we should also economise time, and by doing this necessarily lessen the charges attendant upon a great length of time being consumed in making the passage through a given portion of the canal. On this ground alone I think we are justified in calling the attention of the Government, and asking them to take some other advice in addition to that which they now possess. I want further to call attention to the disingenuous manner in which the chief engineer speaks of the construction of the dam. He says:

"Those who have given careful attention to such matters and are free to deal with the question on its merits,—"

I scarcely understand that phrase. My opinion is that every man in this country is free to deal with this question on its merits.—

"—will scarcely fail to observe that dams of such a height, made otherwise of moderate dimensions in the ordinary way, of the class of materials of which some of the banks are represented to consist, would not be likely to receive a favorable impression of their security."

Why should they be constructed in that way? Why should they be made of the material of which some of the banks are represented to consist? Why should they not be made of good material and be properly made? How, then, can he presume to condemn a work because of his own proposed construction of it in any but a proper and satisfactory manner?

"In fact they might reasonably be led to the conclusion that the adoption of the proposed means to meet uncertain risks might result in others quite as perplexing, if not even of a still more formidable kind, unless precautions were taken other than usual for even banks of the height required."

That would certainly be the case; and it would be his duty to see that they were properly constructed of good material and placed beyond a chance of breaking away. He, further, says:

"At places where the present banks are close to the margin of the river and the water alongside more than five feet in depth, a rough class of narrow crib-work will be placed to keep the bridge material in position until it is consolidated. The whole of the banks are afterwards to be well protected by a facing of stone."

It is said of a lady's letter that the gist is nearly always in the postscript. So it is in this document. We have before us his estimate of the cost of the construction of the works

which he has proposed, but we have not before us the estimate of the cost of the stonework which he proposes to employ for the purpose of strengthening the banks made of the slush and soft material which he intends to throw over them. Practical men, who have been engaged in such work, and who have completed them and who know their cost, say that the strengthening of the bank with that crib-work and rough stone, as he calls it afterwards, would cost almost as much as the present work under contract. And Mr. Page himself admits that there is something wrong about his plans, because he says :

"It is, no doubt, true that placing the dredge material on the outer side is not the position where it would be most serviceable to banks of the description these are represented to be; still, the material will have a sectional area and extent, and be of a nature that, when fully consolidated, it would almost, if not altogether, retain the water in the canal were the old banks opposite the respective places where it is used removed altogether."

We desire to wholly retain the water; and this recalls to my memory the reports of Mr. Mills and Mr. Wright. Almost in identical words with theirs, he says :

"Of the feasibility, efficiency and safety of enlarging the present canal in the manner described in the specification on which the work is let, the slightest doubt is not entertained by me; but as regards forming the 'Sny' or north branch of the river into a navigable channel by means of dams at both ends of Sheik's Island, it must be confessed that my perception is quite as obtuse as was that of the late John B. Mills, who, it appears, failed to see the importance of it."

Now, Mr. Speaker, although he sees "the feasibility, efficiency and safety" of enlarging the canal in the way which he proposes, yet in another place he admits that the material is bad, and he proposes a plan by which, in raising the soft material and mixing it up in boxes and dredges, he hopes that at sometime or other it will become solid. He says that the plan proposed was objected to by Mr. Mills, and he adds, as regards forming the "Sny" or north branch of the river into a navigable channel by means of dams, that "his perception is quite as obtuse as that of the late John B. Mills, who, it appears, failed to see the importance of it." Will it be believed that Mr. John B. Mills did not fail to see the importance of it; will it be believed that Mr. John B. Mills recognised the importance of it, and that he was so fully alive to it, that, when leaving the canal, to the chief commissioners, he reported as follows. He was called upon to report as to the two plans: the Hooples' Creek plan, which I brought before the Government 10 years ago, as my Right hon. friend at the head of the Government will remember, and his own plan along the river. Here are his words :

"It is a favorable feature of the river plan, that for so great a part of the distance you occupy the river, consequently that you have so much less canal in danger of derangement and requiring repair. The works in contemplation will certainly be safer at either extremos of the height of the floods than at any point between (considering the location as it respects the line the same); consequently, if the works are not quite up, then the nearer they are to the point of the water subsided the more safe they are. Upon the inland route you will observe that your works are not only up, but out of the way of danger from ice and flood. By these remarks, I wish not to disguise the fact, that there may be accidents and that there is danger of breaches and interruptions in the use of similar works, whatever be their situation and whatever be your forecast and precaution; but in the case before you, the probabilities of interruptions, derangements and expense of repairs in the one, hardly deserve to be named when considering the other.

"The river plan appears favorable, when considering the first expenditure."

And mark what he says :

"But before you pronounce it the economical, the judicious, and altogether the best plan to be pursued, you must consider what it accomplishes and what you have got for your money. In the first place, you have got an imperfect improvement, and one which does not secure the ends contemplated; secondly, the works and construction of the improvement, the business, the commercial operations of the whole country are jeopardized upon an unexpected and oft-occurring casualty, which may be avoided for the sum of £25,000 or £30,000; thirdly, in case of repairs being necessary they must be done at greater expense, and the same advantage cannot be taken of the season for repairs. These are matters which are perfectly within the comprehension of your board, and I hope they will receive the consideration which they deserve."

If a more emphatic or a more positive contradiction could be given to the report of Mr. Page by Mr. Mills, to whom he appeals, I should like to hear of it.

MONDAY, March 18th.

Mr. BERGIN. When the House rose at six o'clock on Wednesday last, I was discussing the manner of the construction of the Cornwall Canal, the foundation upon which it was constructed, and the materials with which it was constructed, and I quoted to the House the opinion of Mr. J. B. Mills, the engineer, as to the want of safety of a bank constructed along the river, and the necessity of constructing an inland canal. I now come to that portion of Mr. Page's report of the 27th February last, in which he says :

"It is quite true that the volume of water that passes down the 'Sny' is very small compared with the main body of the River St. Lawrence; at the narrowest place immediately below the rapids, the sectional area of the waterway at the lowest stage of the river is about 600 square feet, all of which passes through the dam at Moulinette and the

openings made in it. When the river is at its high stages, the volume that passes down the 'Sny' is, of course, proportionately greater. In January, 1888, during an ice jam, large quantities of ice passed down the north branch, and destroyed in a great measure the mills and dam at Moulinette. If there had been a dam at that time at the north-west point of the island, it is fully believed that no one can say with any degree of certainty what would result, nor indeed what would be the effect at any time of closing the north branch of the river. The St. Lawrence is on too grand a scale to admit of the probable result of interference with it to be even approximated by the use of formulæ fairly applicable to ordinary streams. It is a well-known fact that the river has been seriously affected by causes either little understood or altogether ignored by those desirous of accomplishing certain objects, apparently irrespective of ulterior results."

This criticism of the chief engineer upon the report of Mr. Keefer is certainly a most unfair one. He gives his Minister to understand that a large volume of water passed through the Chenailles, and that, if a dam were constructed, as was proposed, at the head of Sheik's Island, a serious result would ensue. If such a dam of the proportions mentioned had been constructed in 1888, at the head of Sheik's Island, not a drop of water could have passed through the Chenailles channel. The reference he makes to the gentleman whose report he is criticising, is unworthy of a professional man. The Chief Engineer of Canals might very properly say that the plans recommended by Mr. Samuel Keefer would not accomplish the ends desired, but there was nothing to warrant him in speaking of Mr. Samuel Keefer in this way, and to say that the causes affecting the river were "either little understood, or altogether ignored by those desirous of accomplishing certain objects, apparently irrespective of ulterior results" Such a criticism ought not to come from the Chief Engineer of Canals, but it serves to prove, as I said in the first part of my remarks, that the professional jealousy which served to make this an unsafe canal fifty years ago is to-day attempting to bring about the same result. He says:

"The effect of cutting loose a sheet of ice in a bay, then swinging it across the channel, has been known to lead to the drowning out for a time of a considerable tract of land along the margin of the river, and the closing of a branch of the river at the head of the Beauharnois Canal is well known to have led to a vast deal of trouble and an outlay for land damages of nearly \$400,000."

There is no parallel whatever between the two cases—the closing of a branch of a river at Beauharnois, where there was a swift current, the length 600 or 800 feet and the depth 18 feet, and the closing of what he chooses to call the river, but which is not the river, only a little Chenailles, at the head of Sheik's Island where there is never more than two feet of water. In the latter case it is not possible that

a damage could have been done by erecting a dam at that place. He endeavors, however, to create the impression that damage would result to the lands on the American side of the river, and thereby to induce the Minister to imagine that a dam should not be constructed at the head of Sheik's Island. What is the fact? After the dam was erected, all the water would go during the period of a flood, as it goes now between the islands, Barnhart's Island and the American shore, and the banks on the American shore are from 60 to 80 feet high, so that it is impossible that there could be any flooding of the American lands, for the water has never been known to rise more than 32 or 33 feet; therefore, no damage could arise, and there could be no complication with a foreign country. I think I have now dealt with every passage in Mr. Page's report, and I have shown very fully, by the reports of the engineers employed in the construction of the canal, and by all the evidence I have been able to obtain as to the manner in which the work was performed, to the House and to the public that this work was improperly located in the beginning, that the foundation upon which the banks were laid was bad, that the method of construction was bad, and that that might have been expected from the selection of the engineers under whose direction the work was done. To sustain my contention as to the engineers, let me read a passage from the *Engineering News*, a high authority in the United States, as to the result to banks when they are made under such circumstances, and, bear in mind, that the construction of the banks of the Cornwall Canal was under the direction of the consulting engineer, Mr. Wright, who was then also chief engineer of the Erie Canal. What was the result to the Erie Canal? The *Engineering News* says:

"The Erie Canal, 360 miles long, in a great many places forms a series of earthen dams, ranging from 10 feet to 50 feet in height, with water from 7 feet to 30 feet deep behind them. These banks were generally made of water-tight earth, with vertical puddle walls in the middle. Many of these banks have failed from improper construction. In a dozen or more places——"

And this shows that the same causes that resulted in the destruction of our banks here, have resulted in the destruction of the banks of the Erie Canal—

"In a dozen or more places the wheeling planks used in construction had been covered up, and thus provided for the escape of the first film of water which finally resulted in a breach. In another case an old tow-rope left in the bank resulted in a breach. A third unlooked-for source of trouble resulted from the dumping of the wheeling planks, running across the bank, on material containing small stones."

One would suppose that the engineer was speaking of the destruction of the banks from the Long Sault to Mille Roches in the Cornwall Canal.

"This stone naturally rolled to the foot of the slope and practically formed a blind drain which eventually brought about a leak."

Now, Sir, if this had been written of the Cornwall Canal, it would have been a strictly accurate representation of the causes and effects which have characterised that canal. I shall bring only one other authority to show that the banks of the Cornwall Canal are not in a condition to be meddled with in the manner in which it is proposed to meddle with them by the chief engineer, and the authority I shall bring in support of my statement, is that of the chief engineer himself, in his report made in the year 1874, on the navigation of the River St. Lawrence, to the Minister of Public Works. Speaking of the improved canal, he says this:

"From the general appearance of the south bank, together with what could be learned of its formation, there is reason to believe that it would be injudicious to interfere with it in any way. The widening must, therefore, be done altogether on the north side, although the ground is, for the most part, high, and has every indication of being unusually hard."

And you will remember, Sir, that, on Wednesday last, I quoted from the report of Mr. Page, made on the 27th February, that he actually had in contemplation, notwithstanding that he knew the insecurity of this bank of the canal, to go on and enlarge it in the manner proposed. He also adds:

"It may also be observed that the ground on the landward side is fully 40 feet higher than the proposed bottom of the reach. From the depth which the channel has to be sunk, it will be evident that the guard lock must be taken down and a new one built; at the same time a wider raceway formed, and a much larger supply weir constructed. To admit of this being done, and of new structures being placed in nearly the same positions as the present ones, the water would have to be drawn off for one full winter, a state of matters that should, if possible, be avoided, as it would involve the stoppage of all the mills and factories at Cornwall, and thereby throw a great number of persons out of employment. By the selection of another site for the lock and weir, this unfavorable result, it is believed, might be entirely avoided, a better class of work secured, and the outlay very little, if any, increased. There is, however, good reason to believe —"

And I would ask the attention of the Government to this, because it is the severest possible condemnation of the plan which he proposes now to follow—

"—that any place much below the present structure could not be judiciously chosen for the purpose, as the present water-level of the canal is several feet higher than that of the river immediately opposite, whilst the bank between them is of a nature unlikely to retain the water, if the level of the high stages of the river were extended farther downwards."

Yet the man who penned this report in 1874, who knew so thoroughly then that the bank was so bad that he could not move the guard lock further down, to-day, in his report, affirms that the bank is thoroughly safe and thoroughly sound, and that he has no hesitation in saying that the construction, under his present proposed plan, is feasible and safe, and that there can be no doubt of the correctness of his statement. If that is not enough, let me read you this further passage from his report:

"It is, therefore, believed that whatever advantages could be gained from a more easterly position for the guard-lock, they are more than counterbalanced by the risk connected with raising the water on an uncertain portion of the bank."

This, Sir, is the testimony of the Chief Engineer of Canals himself, and I do not think that anything has occurred to improve the quality of the bank since that time. He, himself, has shown by the report he has made, that the breach which occurred in the bank in the month of October last, and which caused so much injury to the commerce of this country, which resulted in such terrible loss to the merchants, mariners and others, in this country, was produced in the manner which had been predicted by himself and by the engineers who constructed this canal. He objects, it is true, to the dams which we proposed, as being equally uncertain and insecure. He surely cannot have consulted the engineering works of modern times, or he would know, from the reports that had been given in connection with the great dams that have broken away in different places in other countries, that there is a method of making dams secure, dams which will last for all time. The causes through which dams heretofore have broken away, have been thoroughly exposed, and amongst those causes is the cause of the breaking away of the banks of the Cornwall Canal in the month of October last, and that cause was the puddling of that canal by Colonel Philpotts, in his endeavor to make the bank, which he knew was bad, perfectly safe. Let me read to you from Mr. McAlpine—and there is no higher engineering authority on this continent, or in the old world, upon works of this kind—what he says as regards this puddling of banks, and he gives it as the result of an examination made in the breaking away of dams, both in the old country and in this, particularly the Croton dam, that was constructed by Mr. Jervis, one of the most eminent engineers in the United States, and another one which was constructed by the then Major General R. E. Lee, the great Confederate General of the South, one of the most accomplished engineers in America.

"No puddle wall should be made through the bank, for the effect of puddling is to render the earth more compact, and its eventual settlement will be less than that of the adjacent earth. And by reason of this unequal settlement, in time a vertical crack will be produced, extending along both faces of the puddle wall, and into these cracks rain or seepage water will settle and make it almost impossible to effect a subsequent union of the two masses."

And this, Sir, is what occurred in the Cornwall Canal banks. When it broke away, there were to be seen standing up, like broken pillars, portions of the puddle wall. They had not settled, the other earth had broken away from the puddle and that very puddling had been, to a great extent, the cause of the break. With this I conclude what I have to say upon Mr. Page's report of the 27th of February, and which, I repeat, would not have seen the light but for the notice which I put upon the paper, asking for it. This I have reason to know, because I asked the Minister of Railways to cause a survey to be made from Hooples' Creek to Sand Bridge, with a view to getting an increased volume of water, so that the Cornwall Canal might have a sufficient supply, both for manufacturing and navigation purposes. That survey was made, plans and profiles were prepared, and estimates were also prepared and sent in to the chief engineer, but they were pigeon-holed, and we have not seen them yet. The chief engineer gives it to be understood that any change in the work will cost a very much larger sum of money than that which he now proposes to expend. The same excuse for not building an inland canal was made in 1833, with the result that we have had several breaks, and although in the early days those breaks did not cause much interruption to the trade of the country, and did not cause any very serious damage to trade, yet this last one was so disastrous that the country cannot afford to-day, no matter at what cost, to leave the canal in an insecure condition. Let me compare the estimate which Mr. Page has made with the estimate which I have caused to be prepared, and which I have reason to know is in excess of what the work could be contracted for. Before doing this, let me briefly state to the House the changes which are sought to be made. These changes are: (1) A canal to be made from Archibald's Point through the low ground by Hooples' Creek to Sand Bridge; (2) A dam at the foot and head of Sheik's Island; and (3) the removal entirely of the lock No. 19, and the reduction of the level between Nos. 20 and 19 to the level of No. 18. This would also do away with a guard lock, and as the result we would have seven miles of uninterrupted navigation from Archibald's Point to Maple Grove,

requiring no towpath, and which distance could be traversed in from one hour to one hour and fifteen minutes, thus reducing the time now occupied by a vessel in passing through the Cornwall Canal—generally ten hours up and twelve hours down—to between four and five hours. I ask the House if such a change as that in the interests of the trade of the country is not worth the expenditure even of a hundred thousand dollars or so in excess of Mr. Page's estimate of the cost of the present work? But, when I come to read my estimate I think hon. members will find that the work it is proposed to carry out, in order to make the canal perfectly safe, will cost less than the work proposed by Mr. Page. The estimated amount of the contracts that he has given out from Mille Roches to the Long Sault is \$1,200,000. To this I add—for which he has made no estimate, and I am sure I am \$75,000 or \$100,000 under what it will cost—for crib-work and rip-rap, which he proposes to add afterwards, \$300,000, which will bring the entire cost of Mr. Page's proposed work up to \$1,500,000. What is the estimate for the changes proposed? A new canal from Archibald's Point to Sand Bridge, inland, that can never break away, \$900,000; cost of the two dams, which Mr. Keefer proposes, \$195,000; from Maple Grove to Mille Roches, including bridge, \$140,000; compensation to contractors on account of change of line and abandonment of existing contract, say \$100,000, which will make a total of \$1,235,000. From that sum I should deduct the cost of two locks, which at a very low estimate would be \$300,000, or making the entire sum \$935,000, as against Mr. Page's estimate of \$1,500,000. But as our plan would also necessitate the raising of lock 20 six feet, I am willing to allow for that the full cost of the locks \$150,000, which would make the total cost of our plan \$1,185,000, still leaving a saving of \$315,000. In addition to the saving which this plan would cause, there is the maintenance and operating of two locks for all time saved by our proposition, or about, including interest on capital, \$10,000 or \$12,000 a year. There is one remark to be made in regard to the change we propose. No matter if our plan costs more than that of Mr. Page, if it were carried out the Cornwall Canal could be injured by nothing short of an earthquake. But I have yet to find the engineer or practical man who will say for one moment that the present Cornwall Canal bank will be safe for one hour when the frost begins to come out of the ground. I go further, and I venture to predict that where the break occurred in the canal in October last, unless some change is made in the

plan which the chief engineer is following to day to repair that bank, the whole of it will be in the river by the middle of June. Why, any man of common sense—a man does not require to be an engineer to understand it—knows that if you throw great blocks of frozen earth into the water, this material cannot possibly knit together or consolidate. This earth is thrown in on the top of stone, there is no effort made to pulverize it, and when the frost comes out the mass will explode and the whole run into the river. A man does not require to be an engineer to know that, and I say, and am speaking with full knowledge when I say, that there never was a more mismanaged work than the repairing of that breach in the months of October and November last, and I charge that the Chief Engineer of Canals allowed most valuable time to elapse after the repair of that break. Then was the time when he should have taken the utmost precaution to have strengthened the bank and prevented it from ever falling away. During many weeks he had very fine weather, after the rainy season, during which the bank could have been repaired. He could have employed any number of men, and have put in solid dry earth, not the frozen material he is using there to-day, and in three weeks at the outside, long before the frost came, he could have made a solid and fairly strong bank, which would have lasted this season at all events. But he did not choose to do so, and the result will be as I predict. I now propose to direct the attention of the House to the dangerous state of this canal in other respects. The entrance to the canal is a tortuous, difficult and dangerous one. A tug when entering is obliged to steer over to the north shore of the canal in order to get within the pier. As she does so the current catches the hindermost barges of her tow and they are swung out to the stream, and whilst they are swinging to the stream she makes her way across from the north shore to get inside the pier which is on the south side of the canal, and then her barges swing back. They are caught there by the eddy, swung across again to the pier, and very often barges have sunken at the pier, and sometimes have broken away and drifted down to strand on Crab Island, or some place in the neighborhood. This causes great loss, and the underwriters are obliged to pay large sums of money in consequence. This is not a matter of which the chief engineer ought to be held entirely innocent, because he knows the condition of the river, he knows the state of the current and the eddies, he knows that the entrance is too narrow, he knows that there are boulders at the entrance to the channel on which vessels have grounded, and he knows, moreover, what

is a matter of great importance to the town of Cornwall, that during three and sometimes four weeks of the year, the entrance to the canal is frozen solid to the bottom, that not a drop of water enters, and that the consequences are two thousand poor people in the town of Cornwall are during all that time unemployed. But, Sir, what excuse does he offer for leaving the canal in this dangerous state? He says, his excuse is, that it is caused by frazil, and that nobody knows anything about frazil. Frazil has no more to do with it than I have. I took the chief engineer up there, and I pointed out to him that the ice comes down the river and fills up the channel between the pier and the main shore, and then so soon as the surface is covered the blocks of ice that follow go under the top ice and so on, and so on, until it is filled to the bottom. It is only at great risk of life to the canal laborers that they are ever able to make a passage through that ice so as to get a supply of water for the mills. That is all because the chief engineer is wedded to his idols, and he appears to have seen nothing, to have heard nothing, and to have learned nothing, during the thirty years he has been in charge of the work. Because of that, forsooth, the canal is to remain in dangerous condition and no change whatever is to be made. Having said this much as to the entrance at the head of the canal, let me say something as to the entrance at the foot. A few years ago, when the manufacturers and the forwarders of this country were calling for an increased water supply to the Cornwall Canal, the chief engineer recommended that the work of the improvement of the canal should be begun; but, in keeping with everything which he has done in connection with these canals, he proposed to give us a water supply, not by building new locks and a larger entrance at the head, but by building new locks and removing the entrance at the foot. Instead of giving us an increased water supply he showed us the way to let the water out, but he found out no means of letting the water in.

Mr. RYKERT. How did he do that?

Mr. BERGIN. By building the locks at the foot instead of at the head of the canal. Had they been built at the head they would have given an additional supply. Now, the entrance at the foot is a dangerous entrance as well as the entrance at the head of the canal. We have no range lights at the foot, there are no buoys or beacons put upon the north shore of the Cornwall Island, and no lights to show the mariners the new channel which it is necessary

for them to take if they would enter the Cornwall Canal with safety. We all remember the terrible accident to the *Passport* two or three years ago, by which the Richelieu and Ontario Navigation Co. lost an immense sum of money, and it was a miracle that a large number of lives were not lost also. Why did this accident occur? Because there were no range lights, no buoy or no beacon on the north side of the Cornwall Island. Mariners to this day are ignorant that there is a fine channel from between Pelos's and Colquhoun's Island. There is a safe channel, a deep channel and a straight channel running directly into the mouth of the canal, but they have had no information given to them, and they have gone on ever since that day using the only channel known to them, a channel on the north side hugging the north shore and crossing in a current to be caught in the eddy and forced upon the stone pier on the south side of the entrance to the canal. I charge that the accident to the *Passport* is not the only accident which has happened in consequence of the carelessness (to use the mildest possible term) of the chief engineer. Only the other day, comparatively speaking, the steamer *Passport* was wrecked at the foot of lock 19, when the captain had his thigh bone broken. He escaped with his life it is true, but several men were seriously injured. What brought about that accident? It was the improper construction of the weir at that lock, which was constructed many years ago under the direction of Mr. Legge. Mr. Page discovered long since that that weir was not only improperly located, but that it was improperly constructed. In his report of 1874 he pointed out the danger to navigation from that weir. He might have had occasion to point out a greater danger to navigation but for the close and watchful attention of the superintendent of the canal, who saw that the swash from this weir was constantly wearing away the bank; had it not been for the superintendent we would have had a breach in that bank at the foot of the lock as we had a breach the other day at another portion of the canal. Mr. Page himself was perfectly aware of this and during all these years, although it would not have cost a single dollar to this country to have altered that weir—because every day the men upon his scows were hauling earth away to strengthen the banks in the portions that appeared to them to be weakened at the time—and they could have taken that earth and constructed a new weir during these fifteen or twenty years; the weir would have led down straight into the canal, and the water would not have interfered with any

vessel or have done any damage of any kind. Speaking of that weir, Mr. Page says:

"The balance of the supply required for the Cornwall level, in addition to that above stated, is furnished over and through a weir situated at right angles to the lock, a place nearly opposite the lower quoin."

It is almost incredible that a man of the high reputation of the Chief Engineer of Canals should have allowed that weir to remain there during so many years without making any attempt to alter or improve it, knowing full well that it must do great injury to navigation. The report goes on to say:

"It will be obvious that this means of admitting the supply must be wholly inadequate to the requirements, when it is borne in mind that at low stages of the river the water above the guard lock is on the same level as that below it, and frequently, during some years, the river level is not more than one foot over that of the canal."

He says again:

"The reach between locks 18 and 19 is 7,789 feet in length, and the supply to it is maintained in a similar manner to that of the level below, except that the weir is below the lock and in a position which throws the current more directly across the channel. The supply to this reach passes over and through a weir built on the north side, opposite the head of the lock, thence by a raceway which enters a short distance lower down on the same level as that of the canal. It is, however, found that the position and direction of the strong current thus produced are very objectionable to upward-bound vessels entering the lock."

Here, Sir, I have the whole case stated by Mr. Page himself, an acknowledgment made fifteen years ago that this weir was a source of danger to vessels, and more particularly to upward-bound vessels. Now, Sir, let me draw your attention to the condition of the locks, and I will speak first of the lock gates. Except in the two new locks which have been constructed, there is not to-day a lock gate on the Cornwall Canal that is fit for service. These lock gates, the majority of them, have been in use over 20 years, and during that time the gate posts have been worn; the stone in which the gate posts fit, and they ought to fit tightly, has been worn away; the gates have worn away; the heel points or pivots of the gates have worn away, and the sockets in which the heel points rest, and which are made of brass, have become enlarged, and consequently when the gates are opened they sway and swing. They have not a true pivot point on which to rest nor true sockets in which the points can work. That is not all. There is not to-day in a single lock a track on which any gate can run, and run with ease and facility, or which a man can move without the exertion of more than fairly honest effort. Why, Sir, on one of these locks we have had men

injured for life over and over again, because the gates were so out of gear that it was impossible for the men to handle them. One man is lying to-day a helpless cripple, with an injured spine, and he will be so for all time, having been stricken down in the very prime of life in his attempts to open a gate which two men could not open without difficulty. His little family are dependent upon him for bread, he is powerless to help them. Not far from the canal is another man, a living corpse. In attempting to open the gates, he so over-exerted himself that his bowels were forced out, he was at death's door, and for years past he has had a living death. All these things might have been avoided if the service of the canal had not been starved for years and years. Every representation that has been made with the view of having the service improved has been met with the answer: Wait until the canals are enlarged, and then we will have this done. It is the old story over again: Wait till the horse is stolen, and then lock the stable door. What I have said of the lock gates I may also say of the foundations. The foundations of each lock are rapidly going to pieces. At the foot of each lock, except lock 17—and I will explain why it is not in the same condition in a moment or two—I am speaking now of the old locks—there is a hole from ten to twelve feet deep, and as much in diameter, under the foundations, made by the constant dripping of the water during all these years; and the same would be found at lock 17, but that they found that the bottom was going to drop into the hole two or three years ago, and then they filled it up with stone. Is that a condition in which a great public work like this ought to be? And the mitre sills—well, the less I say about their condition the better. That there is not a good mitre sill on that whole canal—and I do not except those on the new locks—is a fact that cannot be questioned. Now, Sir, let me draw your attention to the method of opening the gates. We all know that a few years ago the Chief Engineer of Canals made a change in the gates. It was not an improvement, because most of the so-called improvements he was obliged to change almost immediately after constructing them. The valves did not work well; complicated machinery was employed, some of which is left. What I maintain is that everything in the shape of machinery in connection with the canal ought to be of the most simple character. It ought to be of a nature that can be comprehended by the poorest intellect. You know the material out of which lock laborers are generally made—not skilled men, machinists or mechanics, but ordinary laborers; and therefore the

machinery put into their hands to work with ought to be of the simplest kind. But instead of that, the machinery given to them was of the most complicated kind. Then, one would think that in putting in these new locks to improve, as he said, the Cornwall Canal, the chief engineer would improve the method of opening the gates. But no; he went back to the old complicated plan of capstan and bars, which was in use when the canal was built. That plan would not work, it would not open and shut a gate, and the superintendent was obliged to resort to the old method of opening the gates. He took the crabs from the old locks and employed them on the new locks in order that the gates could be opened and shut. The Chief Engineer of Canals knows all about that; I have been with him on the canal, and he has seen all this; and—will you believe it?—in the specifications for the new locks he proposes to build on this canal, the same old method of capstan and bar, which experience has proven cannot work, has been called for. This is the way in which the Cornwall Canal is being managed, and it is time I should call the attention of the Government and the country to the matter. Why, Sir, the superintendent of the canal, the masters, the lock laborers, all are blamed for every little accident that may happen on that canal; but the real master, the man without whose authority the superintendent cannot dismiss any man, is the man to blame, and not the men under him who have no control over the canal except to carry out his instructions. You have no idea of the difficulty I have had in obtaining information about this canal. I have gone repeatedly to engineers employed by him and asked for information, but I could not get it without the authority of the chief engineer. I will show you how important it is to the country that information should be obtained and laid before the country as to the navigation of the St. Lawrence, and how impossible it has been for me, up to this time, to get that information. We have, Sir, on the Lachine Canal—I do not know whether we have not also on the Beauharnois Canal—a telephone apparatus, which has been found to be of immense service. We have asked Mr. Page over and over again to give us a telephone service on the Cornwall Canal; but no, no matter what other canal gets a telephone service, he has none for the Cornwall Canal. You can well understand that once a break takes place in a gate, or a weir is stopped, or a valve breaks, or any accident occurs that requires immediate attention, should it

happen at the head of the canal, a man has to come, perhaps in the dead of the night, twelve miles to the superintendent to give him information, and then they have to travel back twelve miles again, so that from twelve to twenty-four hours is lost, to the serious damage of the trade of the country, before any repairing can be done. All that might be avoided by the establishment of a telephone, which would cost but a trifle. The Cornwall Canal is lighted up, as it has been for many years past, by coal oil. Why can it not be lighted, as the Lachine Canal is, by electric light, and thus give extra advantage to mariners? We found the benefit of the electric light during the breach in the canal in the fall, when electrical apparatus was established there, and work was done both night and day. That would greatly facilitate the working of the canal, and had we an electric light of our own at the time the break occurred, much time would have been saved. All these drawbacks mean great delay in the passage of vessels through the canal, and these delays have been complained of time and again. They have been frequently brought before the chief engineer, but he never could see his way to increase the facilities or to lessen the time occupied in passing through the canal. Now, I have pointed out to him a way by which he can make an uninterrupted inland canal at less cost than by the means which he proposes. By making the head of the canal at lock 20, he will diminish the delay in passing through the canal from the number of hours I have mentioned to four or five hours. All these things I have mentioned—the telegraph or telephone, the electric light—will contribute towards the safety of the navigation of the canal. I wish to say a word or two as to the condition of the lock houses. I suppose that the plans for these houses were submitted to the Chief Engineer of Canals. I know that the intention of the Government has never been directed to the condition of these lock houses, but now that they will of necessity be obliged, in consequence of the change in the location and the new entrance to the Cornwall Canal at the foot, and in consequence of the floods which occurred, to build new lock houses, I ask them at all events to make some little provision for the health of the people who occupy them. These houses have two small rooms on the ground floor. They are only one story in height. The lock laborers, almost without exception, are married men with families—some of them very young, some of them almost at the full age, or, at all events, young boys and girls at the age of puberty; and they are obliged to crawl in by a

little hole under the roof or else remain in the same room with their parents below. Is that a condition in which laborers ought to be placed by the parties having control of the canal? They ought at least to have a room or two, and these rooms ought to be of the height and size that would give them a sufficient quantity of air to breathe, to enable them to live in health during the hot season, for we know that, during the hot weather, people confined in small rooms cannot possibly be in a good state of health. I think it my duty, because these are little matters which have not yet been brought before the Government, and of which they could possibly know nothing, to bring before them now in order that precautions may be taken to secure the health and safety of the lock laborers. I have spoken strongly upon what I believe to be the defects in the management of the Cornwall Canal, and it may be that some of those who have listened to me are under the impression that I have some personal feeling against the chief engineer. Quite the contrary. The only personal feeling I have for him is one of very great respect. I believe his intentions are good, but intentions will not remedy the evils of which I complain. He, no doubt, has upon his hands perhaps more than he is able to attend to, and in that case help should be provided for him. Having said so much about the Cornwall Canal, I think it only proper that I should say something about the approaches to the canal from the westward of the river and to the eastward. The general impression is that no vessel can reach Montreal from Kingston that draws more than 14 feet of water. As the river is at present, this is true; but if you will look into the reports of Mr. Page, you will find that, at a comparatively small expense, a channel of 20 feet, safe and commodious—a wide channel without any danger of collision—can be made all the way from Kingston to Montreal. Gentlemen who have been in the habit of going to Kingston by the river from Prescott and Brockville know what a narrow and tortuous channel it is in many places. We all know that, at some point between Brockville and Kingston the channel is so narrow that it is almost dangerous for vessels to meet, particularly at Fiddler's Elbow, which is a point pretty well known to almost everyone who travels over that route. Some years ago, when I was at Prescott in command of the 59th Battalion, I had occasion to come in contact with a corps of engineers belonging to the United States' service, who were then making a topographical survey of the lakes and river. We had the honor of entertaining these gentlemen at dinner one night, and during the course of conversation

the chief of the party informed me that he had had a very pleasant interview, a few days before, with our surveyors in their camp on one of the islands above. He further told me, to my astonishment, that our engineers had pointed out to him several mistakes, and on going back to correct their survey he found that everything which had been said by our engineers was strictly correct, and that the fault had been in his own men, who had been careless in throwing the line and plummet. He said: We have been taught also a useful lesson by your engineers, who employ long poles when the water is swift, and in that way they get a more accurate measurement than by line and plummet, which are apt to be carried away, and to make the water appear deeper than it is. I have looked over the plans issued by the United States, and I find there is a perfectly safe and wide channel of more than a mile and a half shorter from Brockville than any of the channels now employed by our people. I would like to know what has become of the report of the survey made by our engineers at that time. I have looked in vain for it through the public documents. I have appealed to Mr. Page's engineers, and they told me they had no authority to give me any information; that whatever report was made, was made to the chief engineer, and that if he did not give it to the country they had no authority to give it; and they would not enlighten me in any way. But the fact is as I have stated. I have studied carefully the plans of the United States engineers, and I find that we can have a safe, wide channel, comparatively, in place of the tortuous and insufficient channel we have now, in no place less than 20 feet of water, and in places even 200 feet. A survey of Lake St. Francis was made in the year 1834 by Mr. Thomson, and the result of that survey, made under the authority of the Government of Upper Canada, showed that all the way from Cornwall to Coteau there was a channel nowhere less than 20 feet. And to-day vessels are grounding every little while upon the shoals in Lake St. Francis when within a few feet of a channel 1,200 feet wide, no less than 20 feet deep, and in the majority of places 80 feet deep. Why is that? Because the engineer has not issued a chart of that channel and pointed out where the wide and deep and safe channel is. I might go further and might keep on until 6 o'clock pointing out the laches in connection with this Cornwall Canal, but I think I have shown enough to prove to the Government and to the country that the closest enquiry should be made before any money be expended upon the con-

tracts which have been let by Mr. Page. If I had been able to get the information, if I had known that the contracts were going to be made without proper enquiry on the part of the chief engineer, I would have moved in this matter twelve months ago, but I had no idea that the contracts would be let in that way, though I knew that Mr. Page was obstinately determined to pursue his own course. When I took him to the head of the canal, and showed him the current which carried the ice inside the pier and showed him that there was no such current ~~through~~ *vide* Hooples' Creek to Archibald's Point, and that there never could be an obstruction by ice if the canal were carried in through there, he refused on the ground that so much money had been expended before. I pointed out to him that he was in no way responsible for the location of the original canal, that he was not in the country at the time, and that it would redound to his credit to remedy the evils which were complained of. He saw those evils and admitted them, but he would not change them because so much money had been already expended. He was determined to send much good money after bad, and the result is seen now. I tell the Government that, if they will issue a Royal Commission, as I hope they will, I shall be prepared to establish every statement I have made by the best scientific and practical authorities in this country. With the permission of the House, I desire to add to the resolution:

And the plans, profiles and estimates made by Mr. Clewes in the year 1826.

A. SENECAI, Superintendent of Printing.

