REPORT

OF THE

National Transcontinental Railway

Investigating Commission

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1914

[No. 123—1914.]

List of Witnesses Examined

February 11, 1914.

HON. FRANK COCHRANE, P.C.,
Minister of Railways and Canals,
Ottawa, Ontario.

SIR,—We have the honour herewith to deliver to you for transmission to His Royal Highness the Governor General of Canada the report of the Commission appointed to investigate the construction of the National Transcontinental Railway.

Yours respectfully,

GEO. LYNCH-STAUNTON,
Chairman.

F. P. GUTELIUS,
Commissioner.

To Field Marshal His Royal Highness Prince Arthur William Patrick Albert, Duke of Connaught and of Strathearn, K.G., K.T., K.P., etc., etc., Governor General of Canada.

MAY IT PLEASE YOUR ROYAL HIGHNESS:

The undersigned have the honour to present to Your Royal Highness the Report of the Commission appointed on the 29th day of January, 1912, to investigate the building of the Transcontinental Railway.

GEO. LYNCH-STAUNTON,
Chairman.

F. P. GUTELIUS,
Commissioner.

OTTAWA, February 11, 1914.

Report of National Transcontinental Railway Investigating Commission.

By Royal Commission dated the 29th day of January, 1912, Your Royal Highness was pleased to appoint the undersigned Commission to investigate the building of the Transcontinental railway. In the performance of the duties imposed upon us we have familiarized ourselves with the work and its history, insofar as possible from an examination of the contracts, estimates, plans and correspondence in the office of the Commission at Ottawa, and by making a personal inspection of all the work done prior to the first day of October, 1911, between Moncton and Winnipeg.

We were attended over each section by the engineers and other officials who had charge of or were familiar with their particular parts of the line which we were from time to time examining, and we took the evidence of these persons, which is appended to the report, either on the ground or immediately after each inspection.

The report is based in the main on the evidence of the persons who had charge of the building of the railway, and on what we ourselves have seen, and we feel that we have thoroughly familiarized ourselves with the facts and circumstances on which we base the findings and opinions herein contained.

The Government of Canada made an agreement on the 29th July, 1903, with the representatives of the proposed Grand Trunk Pacific Railway, which was ratified by an Act of Parliament (3 Edward VII, Chapter 71), whereby the Government agreed to construct a line of single track railway from Moncton, in the province of New Brunswick, to Winnipeg, in the province of Manitoba, according to such plans and specifications as the Government should thereafter determine, to be known as the Eastern division of the National Transcontinental railway. After its construction the road was to be leased to the Grand Trunk Pacific Railway Company, which was to operate and maintain the same for a period of fifty years, paying as a rental therefor three per cent per annum on the cost of construction for the last forty-three years of the term of fifty years. Four commissioners were appointed by the Government to manage the construction of the railway.

CONSTITUTION OF THE COMMISSION.

Until the appointment of Major R. W. Leonard, in the autumn of 1911, no member of the Commission had any experience or knowledge of railway building or operation.

DESIGN OF THE RAILWAY.

The railway was designed, *i.e.*, its standard was decided on, without any knowledge as to whether it was suitable for the country, and on assumptions as to business expected which were unwarranted.

(See page 13.)

PRELIMINARY ESTIMATES OF COST.

When the Bill for the construction of the railway was being discussed in the House of Commons, the Honorable Mr. Fielding, then Minister of Finance, stated that he had been advised by experienced railway men that the cost of such a railway from Quebec to Winnipeg, 1,344 miles, would be $35,000 per mile, or $47,040,000
and from Moncton to Quebec, 460 miles at $31,250 per mile, or 14,375,000

Total..... $61,415,000

(See page 17.)

ACTUAL COST ON WHICH INTEREST IS TO BE PAID BY LESSEES.

Contracts were let for most of the road, and on September 30, 1911, there had already been spent $109,000,000, and Mr. Gordon Grant, the chief engineer, then estimated that when completed the road will, exclusive of interest, have cost $161,300,000.

If the road is completed at this cost by the end of 1914 the Grand Trunk Pacific will commence to pay rent at the beginning of 1922 on this amount with $18,700,000 interest added, making an annual rental of $5,400,000, or about $14,800 a day. (See page 18.)

ACTUAL COST TO THE COUNTRY.

Assuming that the Grand Trunk Pacific Railway Company will commence to pay interest on the cost of construction in 1922, the road will have cost the country for principal and interest $234,651,521. This amount has been arrived at by calculating the interest on the amounts expended during each year from the end of that year up to the end of 1921. (Page 19.)

METHOD OF INVITING TENDERS.

The rules adopted by the Commission in advertising for tenders, the unlimited security required to be furnished by the contractors, and the proposal to let the work for the most part in unreasonably large sections, resulted in only five contractors tendering for 806 miles of the railway, and eleven contracting firms secured all the work and sub-let it to upwards of 100 sub-contractors, who, had the work been divided into reasonably large sections and the security required in other governmental contracts only been exacted, would have in all probability competed in the bidding. As an indication of the handsome profits derived by these eleven firms, it appears that they were paid $8,800,000 in profits for that part of their work which they let to subcontractors. (See page 19.)

METHOD OF AWARDING CONTRACTS.

The contracts for sections No. 8, 150 miles; No. 18, 75 miles; and No. 21, 245 miles; which are estimated to cost, No. 8, $5,011,000; No. 18, $2,100,000, and No. 21, $13,000,000, were not let to the lowest tenderers, and we believe that in at least two or three cases advance information as to estimated quantities was made use of by the successful tenderers. Our reasons for these statements are fully given in that part of this report referring to these contracts. Contracts Nos. 16 and 17, M. P. and J. T. Davis, were improperly allowed to sell at a profit to themselves of $740,000. (Page 19.)

CLASSIFICATION.

The classification prescribed in the contracts was ignored and contractors were overpaid $3,300,000 on improper classification.

(1) *Solid Rock.*

A new sub-classification of solid rock, called "Assembled rock," which is described as "fragments of rock cemented together by interstitial material" was improperly introduced after the contracts were signed, and though $1,835,051 was paid for "assembled rock," there is no material on the line which can possibly be marshalled under that head, and that material which was described as "assembled rock" should have been classified as "loose rock" or as common excavation.

(2) *Ploughable Clay.*

About 1,317,940 yards of ploughable clay on contracts 14, 15 and 16 in New Ontario, which should have been classified as common excavation, were classified as loose rock, resulting in a loss of $750,000.

(3) *Overbreak.*

Overbreak, i.e., rock taken out beyond the section, should never exceed 20 per cent of the intended excavation. On this line it exceeded 40 per cent. The engineers first certified that all overbreak, amounting to $4,084,843.78 should be paid for. The arbitrators reduced their returns by $500,000. We find that that reduction should have been $677,866.59 more than it was. (See page 69.)

GRADES.

Had momentum grades been adopted, as is the usual practice in high-class modern railway construction, they would have in no way impaired the usefulness of the railway, or increased the cost of operation, or reduced its hauling capacity, and $6,200,000 might and should have been saved. (See page 71.)

ALIGNMENT.

Had sharper curves, i.e., curves of a shorter radius than those actually used, been allowed they would not have impaired the usefulness or increased the cost of

operation or reduced the hauling capacity of the road, and $2,400,000 might and should have been saved. (See page 73.)

BRIDGES.

Had wooden trestles been used instead of train fill and steel structures, as was done by the Grand Trunk Pacific on its portion of the line, and as is allowed in the best modern railway construction, they might have been in course of time replaced by fill and steel structures and $2,947,227 thereby saved without impairing the usefulness or reducing the hauling capacity of the railway or increasing the cost of operation. (See page 74).

TRAIN FILLING.

The Commission had an offer from the Grand Trunk Pacific to fill wooden trestles at the rate of 25 cents per cubic yard. Had the Commission made such an agreement to do the train filling after the road was opened, $3,250,000 would have been saved in addition to that included under the last heading. (See page 74.)

BUILDINGS.

The sixteen engine houses to be constructed were considered of such small importance that the contractors were not required, although the attention of the Commission was drawn to the omission, to name a price either in bulk or in detail for their construction, but were given the contractors on prices afterwards to be arranged. In consequence of this, these buildings cost $800,000 more than they otherwise would. In the opinion of this Commission, this was a direct violation of the statute, which clearly requires that contracts be given on tenders which name the price at which the work is to be done. (See page 80.)

STATIONS.

There were sixteen station buildings at different points on the line, each with office accommodation for a staff sufficient to operate 500 miles of railway. Four such might have been justifiable, but no more. These station buildings average $22,000 each, and $204,000 might have been saved here had care been taken to only provide stations with ample accommodation for the operation of the road. (See page 80.)

REDDIT STATIONS.

At Reddit, which is in a wilderness, a station ample in every respect for any possible purpose was built but because it did not comply with the extravagant Grand Trunk Pacific design a second station was built beside it at a cost of $22,112, to the profit of the contractor alone. (See page 80.)

FREIGHT SHEDS, &C.

The design for freight sheds, bunk houses, storehouses, ice-houses, were on an unnecessarily extravagant scale, and there were far too many of them built. Had the design been within reasonable limits and had they been built only where they were useful $300,000 would have been saved. (See page 80.)

CAP ROUGE VIADUCT.

On this viaduct, which is near Quebec, had the piers been built with ordinary open caissons, as they should and could have been the same result would have been had at $250,000 less cost. (See page 88.)

CHAUDIERE CUT.

This cut is about one mile east of the Quebec bridge on the south side of the St. Lawrence river. Notwithstanding the fact that the approach to the Quebec bridge on both sides is over a one per cent grade, the Commission spent $351,000 to preserve the low gradient within one mile of the Quebec Bridge. (See page 90.)

COAL CREEK FILL.

An embankment was built here containing over half a million cubic yards of material of which 200,000 yards was solid rock borrow. The total cost of the fill and arch was $398,000.

If the Commission had built a wooden trestle there they would have saved in seven years $413,000 and could have then built the embankment and the arch and have been $239,000 ahead. (See page 92.)

CHIPMAN GRADE.

On the New Brunswick section there are at mileage 146 and 174 two pusher grades thirteen miles and eleven miles in length respectively, where the grade is 1.10 per cent, yet at Chipman, rather than allow the grade to be increased one tenth per cent the Commissioners spent $178,224. (See page 97.)

LITTLE SALMON RIVER VIADUCT.

This large steel structure, containing 14,000,000 pounds of steel, was erected across the Little Salmon River valley in New Brunswick, at a cost of over $800,000.

If pusher grades had been used in locating this crossing $1,750,000 would have been saved in a distance of 10 miles, and the interest on this sum would in 20 years have paid for a revision of the line if the traffic then warranted it. (See page 98.)

LA TUQUE.

Contrary to the recommendation of the engineers the Government, because it had been stated that this was to be a 0.4 per cent railway, refused to allow a pusher grade to be put in at La Tuque where everybody admitted it should be used, and thereby, for no purpose, wasted $1,000,000. (See page 100.)

SECOND SIDINGS.

The original plan was to build along the whole line at seven mile intervals two sidings of 3,500 feet and 3,235 feet in length, to accommodate two 80 car trains. After having spent $374,500 on the second sidings, the Commission realized that this was an unwarranted expenditure and abandoned the two sidings plan and built only one. (See page 102.)

WEIGHT OF RAILS IN SIDINGS.

On the line there are 367 miles of sidings and yard tracks which are equipped with new 80 pound rails. This was an unjustifiable expenditure as rails of 65 pounds would have answered the purpose equally well, and $340,500 was wasted by not using the lighter rail. (See page 104.)

DOUBLE-TRACKING.

The statute provided that the line should be a single track railway with necessary turn-outs and switches. The Commission, exceeding their authority, double-tracked six miles at an additional expense of $679,692.00. (See page 105.)

TWO PRICES FOR ONE HANDLING OF MATERIAL.

Certain contractors were by a wrong construction of the contract paid two prices for one handling of material. The waste under this head amounted to $75,284.83. (See page 108.)

HEIGHT OF EMBANKMENTS.

On contracts 14, 15 and 16 we find that the extra height of embankments beyond what was necessary to stay within the maximum gradients resulted in unnecessary expenditure of $150.000. (See page 110.)

PILING FOR FOUNDATIONS.

The contracts provided that piles delivered on the ground should be paid for at so much per foot, and that piles driven should be paid for at another price per foot. The contract was unreasonably interpreted to mean that for piles driven the contractor was to be paid for piles delivered and after he drove them he was paid a second time for the piles plus the additional price per foot for driving them. The contractors on contract 9 were in this way overpaid $33,900. (See page 110.)

DRAINING BORROW PITS.

One hundred and sixty-six thousand nine hundred dollars was spent in draining borrow pits, a useless and unjustifiable expenditure. (See page 112.)

NARCISSE DELISLE, HONORE PERRON, FARM CROSSINGS.

The Commission wasted $21,617 changing a six-foot culvert into an under farm crossing for the use of the first man who had given them an option on his whole farm, which is 59 miles west of Quebec, for $3,500, and a further $21,600 in a like case at Honore Perron's farm next to Delisle's. (See page 113.)

FENCES.

Sixty-one thousand three hundred and eighty dollars was spent on unnecessary fences. (See page 117.)

QUEBEC RIGHT OF WAY.—R. R. BERGEVIN.

The chairman of the Commission paid R. Bergevin, of Quebec, $7,950 just after the election of 1911 on a pretended claim for damages to a certain leasehold property. This was a most improper payment and cannot be justified in law or in morals. (See page 118.)

RIVER DU SUD AND CREEK A'SHEA.

The two streams, the River du Sud, 60 miles east of Quebec, and Creek A'Shea, 160 miles west of Quebec, were approached with fills and crossed with 30 and 40-foot concrete arches respectively. Had steel been used, a saving of $234,000 would and should have been made. (See page 121.)

TRANSCONA SHOPS.

The country has been committed to the expenditure of $4,500,000 for the erection and equipment of the Transcona shops at Winnipeg, which, in our opinion, are not authorized by law and which are, in any event, twice as large as are required for the purposes of the Eastern division. (See page 121.)

WINNIPEG ENTRANCE.

Large sums of money could have been saved if ordinary business methods had been adopted in negotiating for and acquiring the entrance to Winnipeg at the proper time. (See page 134.)

DRAINAGE OF ROAD CROSSINGS.

The use of cast-iron pipe instead of concrete pipe is the usual practice to carry water from the ditches along the line under highways and farm crossings accounts for $12,072.15 unnecessary expenditure. (See page 136.)

WATER SUPPLY.

Sixty-two thousand two hundred and eighty dollars was lost by installing gravity water supplies at Pangburn, Beaver Brook, Bluebell and St. Leonard, in District A, New Brunswick, instead of pumping plants. (See page 138.)

PUMPS.

Forty-five thousand six hundred dollars was lost by the installation of fifty-seven gasoline pumping plants instead of steam pumping plants. (See page 138.)

NEW BRUNSWICK SECTION.

Large sums of money in interest have been lost by the premature construction of the New Brunswick section of the railway. In our opinion this section should not have been constructed at all. If one-third of the money had been expended on the Intercolonial railway it would have provided all the trunk line facilities for the province of New Brunswick which would be required for very many years. (See page 138.)

CONOLUSION.

We find that the Transcontinental Railway Commission, the Grand Trunk Pacific Railway, and those having charge of the construction of the railway did not consider it desirable or necessary to practise or encourage economy in the construction of this road.

We find that without including the money which was unnecessarily expended in building the railway east of the St. Lawrence river $40,000,000 at least was needlessly expended in the building of this road.

In the following papers will be found a detailed statement respecting each of the subjects treated herein, and we also include the evidence taken and the documents referred to in this report.

Design of the Railway.

The cost of a railway depends principally upon its design.

The principal feature in the design of a railway through broken country is the gradient, for upon it depends the length of sidings and the size of yards. It controls the curvature; it decides the depth of cuttings and the height of fills, and in a broken country the cost is high or low according to the gradient decided on by the projectors.

It is, therefore, of first importance where cost is to be reckoned with that reliable information as to the character of the country through which the railway is to be built should be obtained by reconnaissance surveys before the gradients and curvature are decided upon. Railroads are built for commercial purposes and "cost of construction and operation" of one class of railway may be by the topographical conditions of the country so great as to prevent the carrying of the traffic which will come over that road being carried at reasonable rates unless the road is to be operated at a continuous loss.

The reason for building the National Transcontinental railway was to afford to the people of Canada increased and cheaper transportation facilities, and that being the object it must be evident that the expenditure must not for any reasons be so great as to require the imposition of such tolls in order to pay interest upon the capital expenditure as will prevent the operating company affording reasonable rates to the public.

An examination of the National Transcontinental Railway Act and of the Grand Trunk Pacific Railway Acts makes it quite clear that it was expected and intended by Parliament that whatever class of railway should be built it would be one on which the capital expenditure would not be so great as to make it unreasonable to expect the operating company to pay the statutory rent of 3 per cent on its entire cost and afford reasonable rates to the public and if a railway was designed which must necessarily cost more that design was not authorized and was contrary to the spirit of the legislation and the intention of Parliament.

Assuming therefore that the Government intended to carry out the will of Parliament, that is, to build a road upon which the Grand Trunk Pacific could afford to pay 3 per cent on the "cost of construction" it was its duty and that of the Commission, before they laid down a hard and fast rule for the guidance of those responsible for the building of the road, to have had made a reconnaissance survey to guide it in its choice of a design for this railway. As will be seen, the Government committed the country to the construction of this railway with grades of 0.4 per cent against east bound and 0.6 per cent against west bound traffics with maximum curves not to exceed 6 degrees without knowing whether such gradient and curvature fitted the country, without any further information than the opinion given by Mr. Schreiber of the cost of a totally different railway and the casual assurance from the Minister of Finance that "from other experienced railway men" he had learned that $31,250 per mile from Quebec to Moncton and $35,000 per mile from Quebec to Winnipeg was a most liberal one.

Having decided upon the design the Commission proceeded to find a country to fit the design.

The engineers sent out to locate a line were, as is usual, furnished with tables of figures called "Tables for equating value of grades and curvature." These tables are always based upon the business expected over the line and are to guide the engineers in locating the line through difficult country. For example, an engineer is confronted with the question as to whether he should go around a mountain, or tunnel or cut through to shorten the track. He knows that it will cost much less to build around the mountain. The tables will tell him the cost of operating the trains over each alternative route and so inform him as to whether the lesser cost of operating through the mountain will or will not be sufficient to justify the larger expenditure of passing through the mountain or not, and as these tables indicate he will decide, or it may be that between two points both on the same level there may intervene a succession of hills through which he may wish to run his road on the level. It will palpably be cheaper to have succession of grades crossing these hills, but it may be that operating expenses will be thereby so much increased that it will be better business to adopt the more expensive one of a level road through the whole section. It is therefore of essential importance that these tables be founded, not on utopian hopes, but rather on prudent assumptions of the business reasonable to be expected. It may seem incredible, but it is the fact that it was assumed that the road would at once receive the maximum business it was possible to carry over a single-track low-grade road. That there was an entire lack of business along the line from Winnipeg to Quebec and from Quebec to Moncton, or that this was a trunk line with no feeders does not seem to have occurred to those who made these tables.

The original estimate was as has been said made by Mr. Collingwood Schreiber, consulting engineer of the Government, who in reply to an inquiry from the Hon. W. S. Fielding, Minister of Finance, stated that a line which would comply with the Government subsidy specifications, that is one with grades up to 1 per cent, curves up to 10 degrees (p. 443), and on which would be used wooden trestles, 60-pound rails, and which could be improved as traffic requirements warranted, could be constructed between the Quebec bridge and Winnipeg for $28,000 per mile, and between the Quebec bridge and Moncton for $25,000 per mile.

This estimate was given by the Hon. Mr. Fielding to Parliament. (See Hansard, 1903, vol. IV, column 8588). In the course of the debate, Mr. J. Charlton, then member for North Norfolk, suggested that instead of building a road as described by Mr. Schreiber, one with grades of only 0.4 per cent should be built. His estimate for such railway, given in Hansard, vol. IV, 1903, column 8505, was $30,000 per mile for the whole distance between Winnipeg and Moncton, at a total of $54,690,000.

Knowing that his estimate was based on 1 per cent grades allowing 10 degree curves, the Minister of Finance said (Hansard, vol. IV, 1903, column 8588):—

> "I have made an estimate of $25,000 per mile for one part (Moncton to Quebec) and $28,000 per mile for the other part (Quebec to Winnipeg), which estimate is backed by the reputation of an engineer of standing. But, if we are to have the high grade—perhaps I should say low grade—road called for by my hon. friend from North Norfolk (Mr. Charlton) perhaps these estimates are not high enough.
>
> "I propose to add 25 per cent to the first estimate of the cost of construction of the Eastern division, and so add 25 per cent to the present value of the seven years' interest of that portion of the road. This is an equivalent to an advance on the cost of from $25,000 to $31,250 per mile for one part, and from $28,000 to $35,000 for the other part. This is a pretty liberal estimate and ought to build even the fine road called for by my hon. friend from Norfolk (Mr Charlton)."

Taking Mr. Charlton's 378 miles east of Quebec bridge at Mr. Fielding's estimate of $31,250 per mile, and Mr. Charlton's 1,435 miles west of Quebec bridge at $35,000 (Mr. Fielding's estimate) we find the above estimate is increased to $62,037,500, which appears to be the largest estimate prepared or suggested prior to the passage of the Acts and in consequence is the largest amount that the Government expected to pay when they entered upon this undertaking or made the contract with the Grand Trunk Pacific.

After the passage of the National Transcontinental Railway Act which was assented to October 24, 1903, the Government, on August 20, 1904, appointed the following commissioners:—Messrs. Fletcher B. Wade, K.C., chairman; Robert Reid, Alfred Brunet and Charles Young. Upon the death of Mr. Wade and the resignation of Mr. Brunet, the Govern nt, on July 31, 1905, appointed Mr. S. N. Parent, K.C., chairman, to succeed Mr. Wade; and Mr. C. F. McIsaac in place of Mr. Brunet. On October 31, 1909, the Government appointed Mr. W. S. Calvert as Commissioner to succeed Mr. Reid, deceased, and on October 23, 1911, the present Government appointed Major R. W. Leonard as chairman and sole commissioner.

That the Government and the Commission settled on the design of the road before a reconnaissance survey had been made, simply guessing at its cost, clearly appears from the above and what follows.

On August 20, 1904, the Government appointed Mr. Hugh D. Lumsden chief engineer and upon his resignation, the Government, on July 17, 1909, appointed Mr. Gordon Grant chief engineer in his stead.

The instructions for field engineers were prepared by Mr. Butler and approved by the chief engineer and commissioners, as described in Mr. Lumsden's report for the year ending June 30, 1905. Under the heading of "Instructions to Engineers" he says:—

> "District engineers were furnished with printed instructions for their guidance and for that of the engineers in charge of parties under them, giving full particulars as to their various duties. They were also instructed to adhere to grades not exceeding 0.4 feet per 100 adverse to eastbound, or 0.5 adverse to westbound traffic, though in regard to the last mentioned, this has been changed to 0.6 per 100 in one or two exceptional cases, the maximum curvature was limited to 4 degrees."

We also find in the Book of Instructions, which was issued and revised in January, 1907, page 46. (See exhibit No. 1):—

> "The maximum grade rising eastwardly on a tangent will be 0.40 per cent, rising westerly the maximum grade will be 0.60 per cent."

Page 38, under the heading "Curvature":—

> "The maximum curve on a level shall not exceed 6 degrees."

The Commission has not been able to learn how the Minister of Finance came to his decision to add 25 per cent to the cost of a one per cent railway to arrive at the estimate of the cost of a four-tenths per cent railway through the same district (p. 444) and Mr. Schreiber advises us that he did not concur in any such estimate.

In addition to the limiting instructions to field engineers contained in the Book of Instructions, the Chief Engineer issued drawing No. 59, table of values for equating distance, rise and fall and curvature, etc., above referred to. (See exhibit No. 2.) These values were taken from various engineering literature which treats

particularly of grade revision and alignment, and betterment of existing railways where the volume of traffic is developed and the cost of operation accurately known, which items form the basis of careful, accurate and minute calculations.

In order to utilize these modern values of distance, rise and fall and curvature, it was necessary, as we have said, for the Chief Engineer to assume a volume of business and costs for a basis on the National Transcontinental railway. The volume of business assumed was (see exhibit No. 3) :—

20 daily trains between Quebec and Moncton, 600 cars, east and west
20 " " " Graham and Winnipeg, 600 cars, east and west.
12 " " " Quebec and Graham, 360 cars east and west.
Assumed cost per train mile, $1.

The volume of traffic assumed is double the present tonnage of the Canadian Pacific Railway Company's transcontinental line, and it is the full capacity of a low grade single track railway.

The cost per train mile assumed is two-thirds of actual train mile costs on other railways where trains are only half as long and where fuel is several dollars less per ton in cost.

With these erroneous assumptions as the foundation of these calculations, the results of the calculations are equally erroneous and their erroneous results were given to the field engineers for guidance.

In the application of these distance values, which requires a comparison, we might take the Canadian Pacific railway and Intercolonial railway.

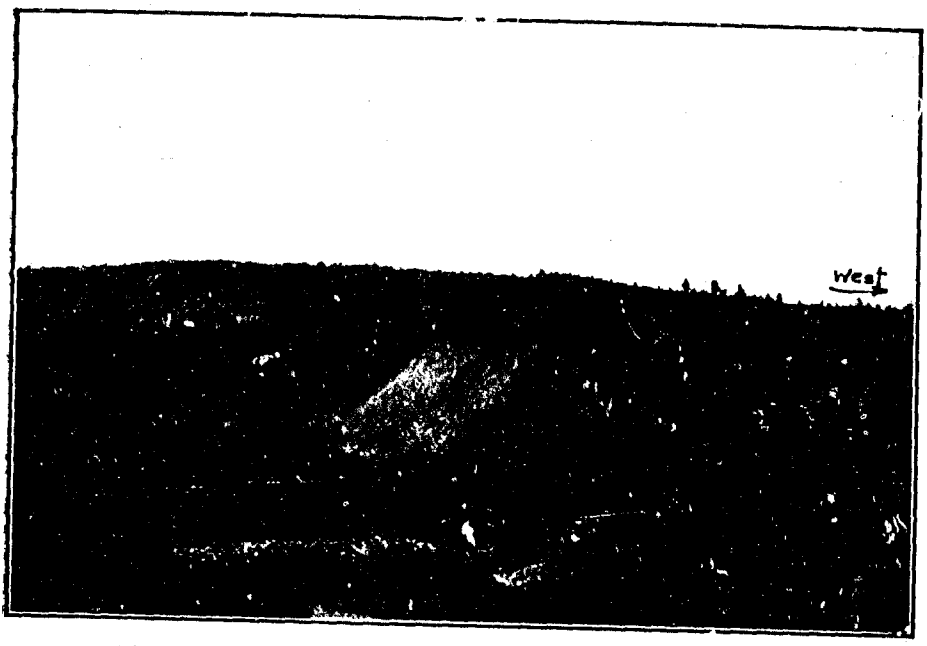
Winnipeg to Moncton, 2,000 miles, say it cost $50,000 per mile. Then to shorten this line to 1,800 miles would permit of expending 200 by $184,000 or $36,800,000 on account of this shortening, or $20,000 per mile for 1,800 miles.

Thus the engineers on location were given instructions which allowed them a latitude equal to about $20,000 for each and every mile, which instructions were concurred in by the Grand Trunk Pacific Railway Company. (See exhibit No. 3.)

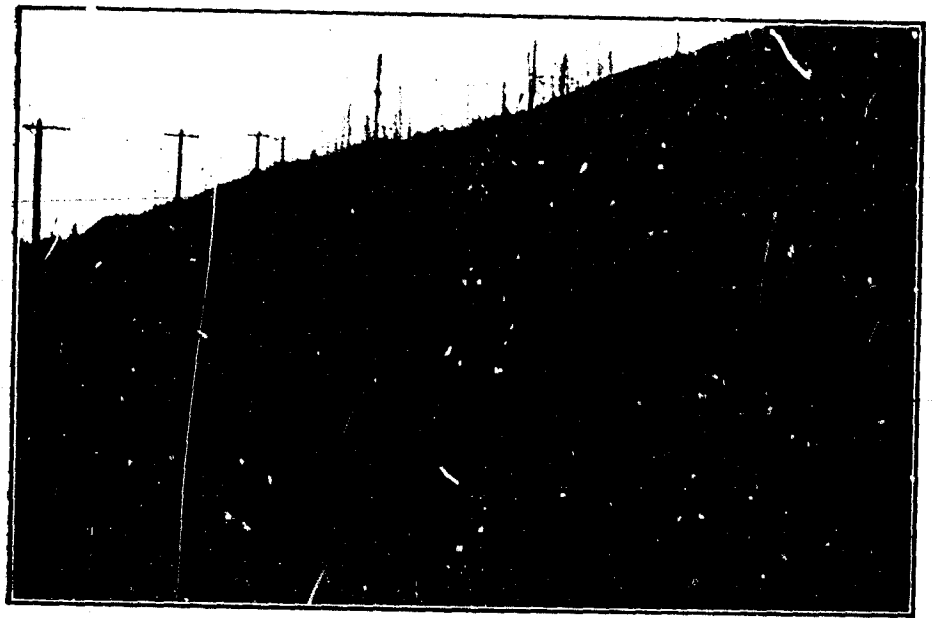
We are unable without detail surveys to say how much money was expended in consequence of these instructions, but the effect of such latitude was enough to induce them to locate as near straight and level as possible, regardless of cost.

The first real information in connection with the high cost of this railway is given in Chief Engineer Lumsden's estimate of June 23, 1908, prepared for the Commissioners and available to the various parties interested, and although it was based on experience on the partial construction of 200 miles, it shows that the estimated cost of the entire line at that time was $114,400,000, and exclusive of the cost of the Winnipeg terminals, Quebec terminals, Quebec branch, or the shops at Transcona, proposed shops at Quebec and any double track. This estimate showed clearly that the railway would cost over 100 per cent more than the highest estimate given to Parliament, and the estimate was made at the time when only two-thirds of the line had been contracted for. The Hodgins Inquiry in 1908 also drew attention to the high cost of the railway in the matter of overclassification—the Lumsden Inquiry in 1910 should have shown that he resigned on account of the high cost of the railway—Mr. Young's Inquiry in 1908 showed that right of way was costing fabulous sums.

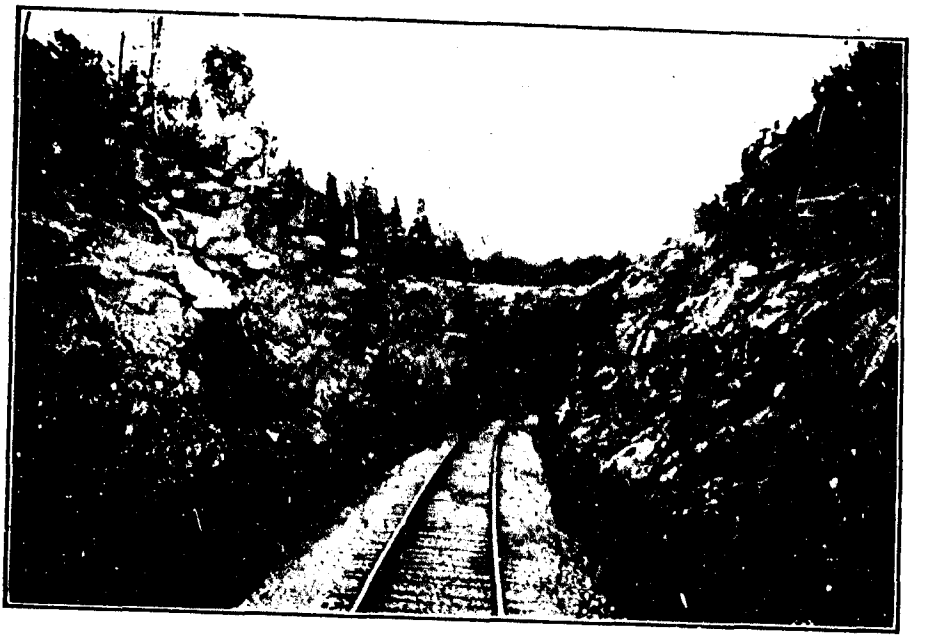
With all of this information before them, what did the Government, the Minister of Railways and Canals, the Grand Trunk Pacific Railway Company, the Commissioners, or the Chief Engineers do towards reducing the cost of the railway? We do not find any instructions or recommendations from the Government to the Commissioners or Minister of Railways and Canals to the Commissioners or the Chief Engineer, or protest from the Grand Trunk Pacific Railway Company or its



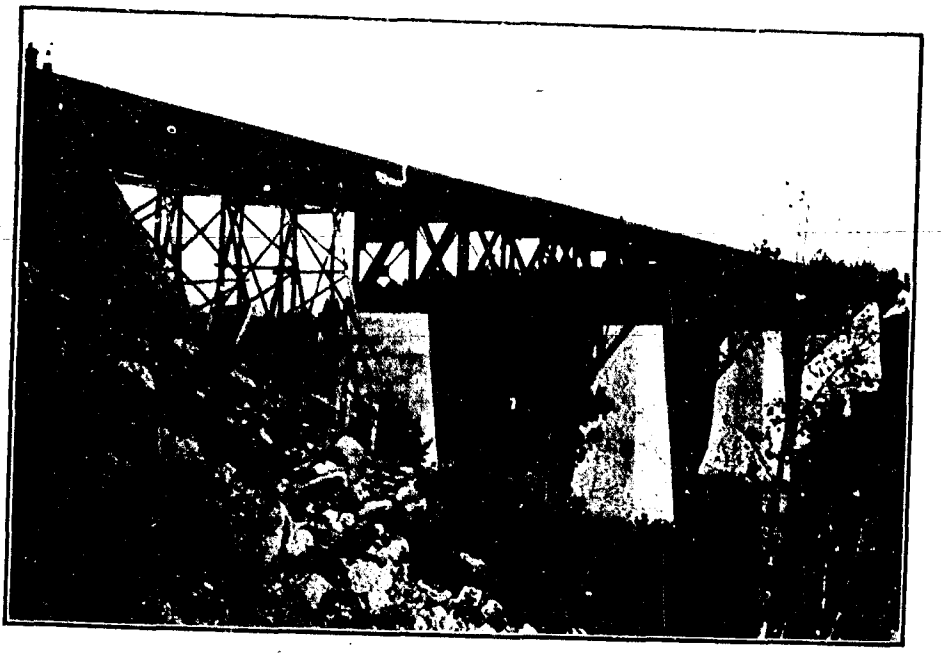
District B, Residency 11, Mileage 64.6. Crossing of Forchue du Pin River. Page 14.



District F, Residency 16, Mileage 80.8. Tunnel. Page 14.



District F, Residency 30, Mileage 128.6. Heavy Work. Page 16



District A, Mileage 165.5. Crossing of the Tobique River. Page 28.

Engineers for retrenchment except in the matter of classification and some minor detail matters to the Commissioners (see exhibit No. 15), or any recommendation or instructions from the Commissioners to the Chief Engineer or the Chief Engineer to the District Engineers, suggesting the advisability of economy or retrenchment on the remainder of the line, although it was then known that the road was going to cost more than double the amount estimated or the amount upon which the legislation was passed.

It is fair, therefore, to assume that the Government and the Grand Trunk Pacific Railway Company were satisfied with this forecast of the ultimate cost of the railway.

The instructions in the matter of gradients are generally in accord with the object of building this kind of railway, *i.e.*, to obtain cheap transportation, or in other words, low freight rates. But the Government and the Commission seem to have lost sight of the object in view and allowed the high-class feature to govern. They raised the cost of the railway by building most extravagant structures, spending millions of dollars on light curvature, unnecessarily taking out cuts, building larger yards than were required, using heavy rails in sidings and yards and by many similar extravagances which did not affect the efficiency of the road. They seem not to have known that there was a maximum of expenditure beyond which if this road was to be used as a freight regulator or as a means of cheap transportation they could not go. The operating company must pay interest on the whole cost of construction or capital investment, and in our opinion the interest payable to the Government and the operating expenses taken together will be about the same as the dividends, interest charges and operating expenses of the competing roads which are only capitalized at from one-third to one-half as much per mile as is the National Transcontinental, and they will in consequence from the same freight and passenger rates be able to pay dividends to their shareholders easier than can the Grand Trunk Pacific pay the rental of 3 per cent on the "cost of construction."

In the following pages we have pointed out the most important of the extravagant and improper expenditures made by the Commission, but it is quite impossible for us within reasonable limits to touch upon them all, and there are numbers, each perhaps, relatively speaking, small, which in the aggregate amount to a very large sum of money and which, had they not been overshadowed by those of which we have treated, would have, in themselves, afforded reason for condemning the conduct of those responsible for their incurrence.

ESTIMATES AND COST OF RAILWAY.

We reproduce the various estimates which have been compiled at various times as to the cost of the National Transcontinental Railway. Based on the actual mileage between Moncton and Winnipeg, Mr. Collingwood Schreiber's original estimate of $25,000.00 per mile (see exhibit No. 4) from Moncton to Quebec, and $28,000.00 per mile from Quebec to Winnipeg, places the cost at $49,132,000. Mr. Fielding's addition of twenty-five per cent on account of the adoption of 0.4 per cent and 0.6 per cent gradients, raises this figure to $61,415,000 (see exhibit No. 5).

Mr. Lumsden's estimate of June 23, 1908, reaches the figure of $114,393,765, or a cost of $63,427 per mile (see exhibit No. 6).

The statement compiled by the Investigating Commission shows the cost of work done up to September 30, 1911, as being $109,173,090 (see exhibit No. 7).

This gross amount is in excess somewhat of the actual expenditure to that date, for the reason that the amounts due contractors for work done during the month of September are included in this sum, the statement showing the value of work done and not the actual expenditures per the accountant's books. In this statement

the general expenses have been distributed among the contracts on the mileage basis, and the same applies to the engineering expenses which have hitherto been charged under the heading of "districts" only. The items in the column of "engineering" cover location, transport and construction engineering.

"Grading" covers the excavation of cuttings, the forming of embankments, and all work consequent to the actual formation of the roadbed proper.

"Tracklaying" covers the purchase of rails and fastenings, switch material, ties, etc., and their installation.

"Bridges and culverts" covers the construction of all concrete arch or pipe culverts, together with the sub and superstructure of steel bridges and viaducts.

"Buildings" covers the various terminal structures, together with way stations, water tanks, etc.

"Right of way" covers the purchase of land required for right of way or station ground, together with the legal and other expenses properly chargeable under that heading.

Under "General Expenses" has been charged the cost of the Commission and their offices, and all head-quarter expenses, together with such minor items which are carried in the accounts under this charge.

In connection with the actual cost up to September 30, 1911, a further statement has been prepared showing the percentage of work completed to that date, compiled from the figures supplied by the Engineering department of the Transcontinental railway, from which will be noted the large amount of work still to be completed at that date, while the cost per mile of main line had reached the figure of $60,100.

An estimate prepared by Mr. Gordon Grant, dated April 18, 1913, places the cost of the completed railway at $161,307,800, or $89,300 per mile of main line. (See exhibit No. 8.)

Bearing in mind the average annual expenditures in the construction of this railway, and the total estimated cost of $161,307,800, with about $140,000,000 expended to date, it would appear that the end of the year 1914 should witness the completion of the through line of railway.

With the addition of the interest charges of three per cent, compounded annually in accordance with the Act, this cost, at the close of 1914, will total $180,000,000 or $99,500 per mile of main line, and upon this sum the rental charge to the Grand Trunk Pacific Railway Company will be based.

Under the terms of the Act, the three per cent rental charge will amount to $5,400,000 annually.

The cost of the National Transcontinental railway to the country is represented by the actual amount of money expended thereon, together with all interest charges payable on these sums.

The Act authorizing the construction of the railway provides that the rate of interest to be paid on any loan to be raised for this work, shall not exceed three and one-half per cent per annum. No loans have been issued by the Government under this Act, but money from revenue or outstanding issues has been used to defray the cost of construction. The records of the Finance Department show that after taking into consideration the figure these issues brought in the market, together with the charges in connection with placing them, the cost to the country in interest has been in excess of three and one-half per cent.

Taking Mr. Gordon Grant's estimate of the total cost, namely, $161,307,800, and assuming that the close of the year 1914 will see the completion of the road, and adding to this sum the compound interest charges at three and a half per cent from the date of the first $16,000,000 expenditure, in the year 1907 up to the close of the year 1921, which date we place as the termination of the seven-year period

during which the Grand Trunk Pacific Railway Company will receive the free use of the railway, the cost to the country, in capital and interest, will have been $234,651,521.

METHOD OF AWARDING THE CONTRACTS AND THE CONSEQUENCES

As there are several important matters considered under this head, an explanation of some length is necessary to their understanding.

For construction purposes, the 1806 miles of railway to be built was divided into 21 sections, the length and location of which will be seen on Exhibit No. 9.

The Commission furnished tender forms (see exhibit No. 10), which included a unit price schedule for various items of work and material connected with the intended contract and named everything which the engineers thought might enter into the construction of the railway in all its ramifications. The tenderers were required to fill in the schedule with their prices per yard, per pound, etc., for excavating and furnishing material.

Before advertising for tenders the engineers made an estimate for each section of the quantities and cost of the various materials and works named in schedule expected to be moved or provided, to be in a position when the tenders were received by placing the prices mentioned in the tenders opposite these items to determine who are the lowest tenderers. A glance at the schedule will make the above quite clear.

The contractors were required to tender on a general contract to do everything towards the building of the railway excepting the supplying of the steel for the tracks, the building of steel bridges, depots, shops, warehouses, freight and fuel sheds. For some reason unknown to us although the other buildings were excluded the engine houses and section houses along the whole line were specifically included in the general contract and, for some other reason quite impossible to understand, it is provided in the contract that the prices named should not apply to engine houses and section houses. That this was deliberately done appears from the fact that the secretary drew the attention of the Commissioners to the omission. Later (see "Buildings," page 80) we will have something more to say about this peculiarity of the contract, which practically allowed the contractors to fix their own prices.

It was open to the Commission to inform the tenderers of the quantities which the engineers estimated would be included in their contracts for the purpose of letting them know what the engineers thought as to the magnitude of the contract.

After consulting with Mr. Collingwood Schreiber, who strongly advised that estimates be not exhibited to the tenderers the Commissioners decided that they would not give to the contractors this information, and would furnish them only with profiles and plans. (Exhibit No. 11.)

The contractors themselves considered that the engineers' estimates were strictly private. (Page 494.)

Where the information is not open to all it is most unfair that any one tenderer should obtain "inside information" because, if he knew the quantities he might put a very high price against an item on which he knew the engineers had not estimated or had only estimated for a small quantity without any fear of the total under that head bulking so large in the entire price as to imperil his chances, or he might, as was done by Fauquier Bros., put a very low price on an item which the engineers had mistakenly estimated at a very large amount.

In awarding the general contracts the first step was to advertise for tenders. A copy of an advertisement is appended. (See exhibit No. 12.) In submitting their tenders the tenderers were to fill in in the column headed "rate" their price for each of the 103 items enumerated. The prices which the contractors were to

submit were to be based on their experience and their knowledge of the country together with the information gathered from the inspection of the plans and profiles, and it was a proper course for the Commissioners to refuse to supply the contractors with any estimate of the quantities or data concerning classification, because as Mr. Schreiber informed the Commissioners it was not the practice of the Department of Railways and Canals to exhibit estimates which were only approximate and often proved, as they did in this case, most inaccurate and misleading, and might be used by the contractor as a basis for claims for damages from misrepresentations.

After they had prepared their tender and filled in the schedule with their prices the various contractors handed their sealed tenders to the Secretary of the Commission, who placed them in a locked tender box. At the appointed time all the tenders were taken from the box and opened privately by the Commissioners in session and the prices in each tender were entered by them upon a sheet of paper. Each tender was given a number, and this number instead of the name of the contractor was entered on the form. These forms were then given to the engineers to money out, using their private estimates of the probable amount of each item as the assumed quantity required on the work which was being let. By using the same quantities for each item of the various tenders and multiplying them by the unit prices in the tenders and adding the amounts opposite each item a total tender price was obtained, and by comparing these totals the various tenders were arranged in their order from the highest to the lowest, and the contracts awarded accordingly.

The tenderers were required by the advertisement to accompany their tender with a marked cheque payable to the Commissioners for sums varying from $10,000 to $400,000 and to agree that in the event of their tender being accepted if they failed to furnish within ten days such additional security as the Commissioners required their cheque should be forfeited. This was the information given to the public. If, however, one applied for the tender forms he would from them learn that the security which he might be required to provide on pain of forfeiting his cheque amounted to one-third of the estimated total consideration of the contract.

One would have expected that the Commission would have followed the governmental practice which was to require (see Order in Council, April 24, 1897, exhibit No. 13) contractors to deposit security to the amount of 5 per cent for contracts amounting to $250,000 and upwards. Indeed, we find that the Honourable Mr. Fielding, after the first three contracts were let, strongly urged on the Commission the advisability of requiring contractors to comply with no more arduous conditions than those imposed by the Government of Canada. Mr. Fielding wrote to Mr. Parent on June 14, 1906: "Do you not think that it is expedient that whatever conclusion the Government and the Commissioners arrive at should be in substance expressed in the advertisements so that parties tendering will be in a position to know exactly what class of security and what amount will be required of the successful bidders? This would avoid some of the questions which arose upon the awarding of the recent contracts."

Despite the suggestion in Mr. Fielding's letter above quoted, the Commissioners ignored his advice and continued the advertisements in the same form for all subsequent contracts.

These extraordinary conditions required the contractors tendering on this work to be prepared to forfeit the certified cheques which accompanied their tenders, unless they were in a position to furnish, within ten days, enormous amounts of security running from one hundred thousand dollars to four millions of dollars.

The conditions in connection with letting the contracts, therefore, were such that the Commissioners held in their own hands the authority to force any contractor to give a cash security which would be so large as: First, to prevent him from securing the contract; and, second, to forfeit the cash deposit which accom-

panied his tender; or they were in a position to make the security as small as they chose to make it. Certainly the Commissioners did not go out of their way to encourage competition.

In order to give some idea of the serious handicap put upon contractors in their efforts to obtain a part of the work on this great Government undertaking, we append a statement giving for the twenty-one grading contracts (which fell to only eleven firms, one of which had a fourth of the whole work) full information, etc., with respect to the security under the following headings:—

(A) Contract No.
(B) Contractor.
(C) Amount of tender.
(D) Amount of cheque deposited with tender.
(E) Amount of security actually called for by Commissioners.
(F) Amount of security which might have been called for under the terms contained in the form of tender.

(A)	(B)	(C)	(D)	(E)	(F)
1.	Grand Trunk Pacific Ry.....	989,985	75,000	75,000	327,000
2.	J. W. McManus.....	389,[illegible]	10,000	28,919	96,300
3.	Grand Trunk Pacific Ry.....	767,434	75,000	75,000	256,800
4.	Grand Trunk Pacific Ry.....	1,898,124	100,000	100,000	632,000
5.	Willard Kitchen Co.....	1,646,253	75,000	75,000	548,000
6.	Lyons & White.....	1,385,941	90,000	90,000	461,900
7.	M. P. & J. T. Davis.....	2,377,409	100,000	100,000	792,400
8.	M. P. & J. T. Davis.....	5,011,346	225,000	225,000	1,670,000
9 & 10.	Hogan & Macdonell	5,297,257	225,000	794,588	1,765,000
11.	Grand Trunk Pacific Ry.....	1,691,073	75,000	75,000	563,000
12.	Macdonell & O'Brien	4,559,284	150,000	150,000	1,519,000
13.	Macdonell & O'Brien	3,815,279	150,000	150,000	1,271,000
14.	Grand Trunk Pacific Ry.....	3,936,901	225,000	225,000	1,323,000
15.	E. F. & G. E. Fauquier.....	3,936,566	150,000	150,000	1,312,000
16.	M. P. & J. T. Davis.....	3,308,048	150,000	150,000	1,102,000
17.	M. P. & J. T. Davis.....	2,019,908	150,000	150,000	673,000
18.	E. F. & G. E. Fauquier.....	2,101,499	100,000	100,000	700,000
19.	O'Brien, Fowler & McDougall..	5,967,208	200,000	200,000	1,989,000
20.	O'Brien & McDougall.....	1,158,258	100,000	125,000	386,000
21.	J. D. McArthur	13,010,399	400,000	1,301,000	4,336,000
	Totals			4,239,507	21,727,400

It will be seen from the following table that for nine contracts covering half the line only five firms tendered, and in one case there was only one bid, while in all the others only two, with the result that M. P. & J. T. Davis secured 204 miles, M. J. O'Brien and partners 246 miles, and the Grand Trunk Pacific 256 miles. This affords convincing evidence that the conditions were too onerous for many firms who afterwards undertook the construction of large sections of the road at lower prices as sub-contractors.

CONTRACT NO. 3. Length, 39 miles.—
Tenderers, 1.—

	Amount of tender.
Grand Trunk Pacific Railway Co.....	$767,434.95

CONTRACT NO. 4. Length, 67 miles,—
Tenderers, 2.—

Grand Trunk Pacific Railway Co.....	$1,898,124.21
Macdonell & O'Brien	2,001,486.51

CONTRACT NO. 12. Length, 107 miles.—
Tenderers, 2.—

Macdonell & O'Brien	$4,559,284.50
M. P. & J. T. Davis.....	4,883,713.50

CONTRACT NO. 13. Length, 115 miles.—

Tenderers, 2.—	
Macdonell & O Brien	$3,815,279.10
M. P. & J. T. Davis	3,876,377.60

CONTRACT NO. 14. Length, 150 miles.—

Tenderers, 2.—	
Grand Trunk Pacific Railway Co.	$3,986,901.42
Pacific Construction Co. (E. F. Fauquier)	4,423,837.11

CONTRACT NO. 15. Length, 100 miles.—

Tenderers, 2.—	
E. F. & G. E. Fauquier	$3,936,566.00
Grand Trunk Pacific Railway Co.	4,334,214.00

CONTRACT NO. 16. Length, 104.2 miles.—

Tenderers, 2.—	
M. P. & J. T. Davis	$3,308,048.25
Grand Trunk Pacific Railway Co.	3,402,585.50

CONTRACT NO. 17. Length, 100 miles.—

Tenderers, 2.—	
M. P. & J. T. Davis	$2,019,908.25
Grand Trunk Pacific Railway Co.	2,106,246.00

CONTRACT NO. 20. Length, 24.13 miles.—

Tenderers, 2.—	
O'Brien & McDougall	$1,158,258.25
J. W. Stewart	1,284,979.50

Had the Commissioners, instead of dividing the line haphazard into sections of from 8 to 247 miles, made them about 50 miles each and prescribed conditions as to security similar to those on any other Government works, there can be no reasonable doubt that many of the more than one hundred sub-contractors to whom the contractors afterwards sublet the work would have been in the field as competitors.

These sub-contractors took the work off the hands of the main contractors at from 10 to 30 per cent less than the contract price. The Commissioners in all cases sanctioned the sub-contracting. This Commission concludes that at least $8,800,000 or about ten per cent of the amounts paid the main contractors, might have been saved if the smaller contractors had been given an opportunity to secure any of the original contracts.

IRREGULARITIES IN AWARDING CONTRACT.

Under another head (page 25) the contracts themselves are dealt with, but we desire to draw attention to the action of the Commission in the awarding of certain contracts.

Contract No. 8.

The engineers' original estimates contained no estimate for trestle timber. A copy of the original estimate was handed to the chairman of the Commission. Afterwards, and before the tenders were received, the engineers amended their estimate by adding an amount of timber for trestles. After the tenders were received and opened, and before they had been awarded, these items were struck out, with

the result that the contract went to a firm which otherwise would not have received it. The engineers say that when, by direction of the chairman, they struck out these items they signed the estimate and dated it on the day on which they signed it, namely, the 18th February, 1907. Some person has for some improper purpose altered the date by erasing the figure 1 so as to make it appear that the signatures of the engineer and the chief engineer, were affixed on the 8th. The facts and evidence respecting this most suspicious proceeding are given under "Contract No. 8," (page 33.)

Contracts Nos. 16 and 17.

These contracts are in the Thunder Bay district, north of lake Nipigon, and were awarded at a time when there was no way to get at them excepting by cutting roads through the wilderness, and when the Commission knew the tenders would necessarily be much higher than they would be if the letting of the contracts were postponed until the railroad had been built up to them at either end.

After these contracts were let at an exceptionally high price the Commission allowed the contractors to defer the commencement of construction for more than a year or until the reason for the high price had disappeared. These contracts are considered at page 47 so it is only necessary to say in this place that for this unbusiness-like step the country paid at least $740,000 for nothing.

Contract No. 18.—Awarded to Fauquier Bros.

Here the engineers estimated 655,400 cubic yards of moss sufficient to provide a carpet twenty feet wide and two feet thick over the entire seventy-five miles. The moss in this case was in reality a negligible quantity, amounting to only some 15,000 cubic yards. Fauquier Bros., knowing that there was little or no moss and believing that the engineers were estimating at a large quantity tendered at 12 cents a yard, while their competitors were all about 30 cents. This mistake secured the contract for Fauquier Bros. Fauquier Bros'. tender was $150,000 less for moss than was Chambers & McQuigge. Had the moss been estimated even approximately correctly, Fauquier Bros. would not have been awarded the contract. The result is that they had the contract, although they were not the lowest tenderers for the work really to be done.

Contract No. 21.

This is the largest contract, 246 miles, estimated to cost $13,000,000, awarded to J. D. McArthur. We found that in McArthur's tender there were forty items for which he had submitted no prices, on which the engineer after the tenders were opened filled in in red ink prices adding: "NOTE.—Red figures show prices made up by Chief Engineer and for the items so marked no prices were quoted in tender No. 4." Properly speaking, McArthur's tender should not have been considered at all.

By incorrectly reading the other tenders, McArthur appeared to be tendering for piling delivered and piling driven a price $64,715 less than his competitors. (See contract No. 21, page 58.) Tender No. 4 was clearly $18,000 lower than McArthur's, yet he got the contract.

CONTRACTS.

By the National Transcontinental Railway Act (1903), this road was to be leased to that company for fifty years at 3 per cent on the "cost of construction" as defined in section 15 of the agreement, schedule to the Act, and by section 7, for the protection of the company as lessees, it is provided that in order to ensure for

the protection of the company as lessees of the road, the economical construction thereof in such a manner that it can be operated to the best advantage, it is to be built under the joint supervision of the Government and the company. Here plainly it was thought by so providing that extravagance or improper outlays being subject to the inspection and criticism of the tenant who should have to pay a rent based on the cost would be checked, as presumably a railway company would be concerned in the safeguarding of its own interests.

Excepting where Mr. Hays urged the cancellation of contracts Nos. 16 and 17, and where he gave his not too strong support to District Engineer Doucet in his efforts to have a pusher grade at La Tuque, and where the company offered to do train-hauled filling after the railroad was completed at half the cost paid by the Commissioners, appreciating the gravity of our statement, we unhesitatingly find that the Grand Trunk Pacific Railway Company, instead of discountenancing, has rather encouraged this inexperienced Commission in its extravagant expenditure on this railway.

If the railway company really expected to operate this railway when completed, according to the terms and at the rental provided in its agreement with the Government, we must attribute its want of proper care to its indifference to the interests of its own shareholders or its desire to so increase the cost of construction of the 353 miles of railway, for which it was contractor, so as to reap the largest present profit possible therefrom.

It was a very credulous Commission indeed if it relied on its contractor, the Grand Trunk Pacific Railway Company, interested as such in high classification, to criticise improper classification where other contractors were concerned, or to expect that that contractor would be astute to discourage expenditures where they were the builders of one-seventh of the line. Their estimates to December 31, 1912, amounted to $15,365,000, and we unhesitatingly condemn the action of the Commission in putting the Grand Trunk Pacific Railway Company in a position where its interests as a contractor conflicted with its duty as an intending lessee. By allowing this Grand Trunk Pacific Railway Company to become contractors, the Commission were inducing that company not only to connive at, but to encourage improper expenditures on the railway.

That the Commission did not appreciate the false position in which they were placing the railway company we can only attribute to the fact that at no time was there ever on the Board a member who had hitherto ever had any experience in the business on which they so lightly entered.

The Grand Trunk Pacific Railway Company were not contractors, nor had they an organization, nor was it equipped with plant necessary to undertake this work, nor did it ever perform any of the work, but acted merely as a middleman between the Commission and its sub-contractors, to whom it let its various contracts at 5 per cent less than its own contract price. We cannot imagine what advantage could be expected to accrue to the country by allowing the railway company to act merely as a go-between.

In the following pages we have summarized each of the twenty-one contracts, giving its history and showing the estimates, and where they were exceeded, the reason for the increase of cost, and why in contracts Nos. 1, 7, 11, 13 and 16 and 17 we are of opinion that the penalty of $5,000 a month should, for the time specified therein, be enforced against the contractors.

We desire to draw particular attention to our criticism and findings on contracts Nos. 8, 13, 16, 17, 18 and 21.

CONTRACT No. 1.

From Moncton, westerly 50 miles. Mile 0—50.
Chief Engineer's estimate of cost, $1,017,051.43.
Tenders advertised for January 5, 1907.
Tenders received February 14, 1907.

SUMMARY OF TENDERS.

		Difference between tenders.
Tender No. 1, Grand Trunk Pacific Railway Co.....	$ 989,895.90	
" No. 2, M. F. Schurman & Co.....	1,146,916.10	
		$157,020.20
" No. 3, Eastern Construction Co.....	$1,186,789.09	
		39,872.99
		$196,893.19

Contract awarded to the Grand Trunk Pacific Railway Company, March 14, 1907.
Date for completion, September 1, 1908.
Work commenced, October, 1907.
Security accompanying tender, $75,000 cash.
Security returned to contractor, April 16, 1909.
Additional security called for, nil.
$100,000 of 10 per cent drawback paid contractor, November 25, 1910.
$100,000 of 10 per cent drawback paid contractor, July, 1911.
Gross amount of progress estimate to December 31, 1911, $2,214,311.20.
Amount of drawback retained on December 31, 1911, $21,431.12.
Percentage of contract complete to December 31, 1911, 97.38 per cent.

The Grand Trunk Pacific Railway Company were awarded this work in March, 1907. They, however, evidently experienced some difficulty in procuring a reliable contractor to take over the work, for it was not until September 23, 1907, that they entered into an agreement with the contracting firm of Corbett & Floesch to undertake the construction of this fifty miles of railway.

The terms of this agreement provide that five per cent of the sum total of the returns under this contract were to be retained by the Grand Trunk Pacific Railway Company as their profits on the transaction. They agreed to construct a road from Chipman to Mileage 57 to the west end of the contract at Mileage 50 so as to enable the contractor to commence operations at both ends at the same time. The amount to be expended on this road was not to exceed $25,000.

The five per cent profit on this work, up to December 31, 1912, amounted to $117,308, from which should be deducted the amount expended on the construction of this temporary roadway from Chipman.

The amount paid the contractors to December 31, 1911, was $1,224,000 in excess of the estimate of the cost of this work based on the successful tenderers' returns, and the following figures, extracted from the engineer's estimate and the returns, indicate to what items of construction this increase is largely due:—

	In estimates		In returns	
S. rock	nil		53,915 c. yds. at $1.50,	$ 79,522.50
L. rock	129,379 c. yds. at .89,	$115,147.31	1,195,267 c. yds. at .55,	657,396.85
C. ex.	1,841,152 c. yds. at .33,	689,168.62	569,067 c. yds. at .25,	140,016.75
Train-hauled filling	nil		170,075 c. yds. at .50,	85,037.50
Solid rock borrow	nil		222,022 c. yds. at 1.10¼,	244,779.26
Special common ex.	nil		283,093 c. yds. at .30,	84,627.90
Overhaul on excavation		$ 43,759.62		289,099.56
Cost of concrete		106,353.50		179,423.79
		$853,429.07		$1,759,998.91

The quantities of the various materials to be excavated, etc., were estimated by District Engineer Dunn from profiles of the final location on forty miles of this work, the other ten miles being estimated from third location profiles.

The train-hauled filling and solid rock borrow unprovided for in the estimate were used in the construction of embankments for which material was not available from the line cuttings. Large portions of this extra material were used in the

enormous fill at Coal creek, Mileage 45, the cost of which, including the arch culvert, amounted to $423,000.

The large divisional yard being constructed one mile west of Moncton, for which no provision was made in the estimate, is another reason for the increase in cost, the engine house, not yet complete, having cost to date over $76,000. The returns to December 31, 1912, on this work amount to $2,346,527 and the contract was reported as being 98.92 per cent complete on that date which is four years, four months after the time specified in the contract for the date of completion.

The Grand Trunk Pacific Railway Company were not apparently prepared or equipped to undertake the construction of this or any work which they tendered for. The delay in the commencement of operations due to difficulty experienced in procuring a reliable contractor to take over the work would have been eliminated had the successful tenderer been a bonafide contracting firm. Without here going into the question of the desirability of the early completion of the work, we feel that the enforcement of the penalty clause of $5,000 a month for the eight months of initial delay and the reduction of the main contractors' profits by that amount of $40,000 would not be an injustice to them.

CONTRACT No. 2.

From a point at or near the town of Chipman, N.B., easterly about 8 miles. Mileage 50-58, District A.

Chief Engineer's estimate of cost, $326,341.

Tenders advertised for June 5, 1907.

Tenders received June 25, 1907.

SUMMARY OF TENDERS.

		Difference between tenders.
Tender No. 4, J. W. McManus Co., Ltd.	$289,190.62	
" No. 2, Willard Kitchen Co.	325,188.68	$35,998.06
" No. 1, Grand Trunk Pacific Railway	337,419.69	12,231.01
" No. 3, M. J. O'Brien, Z. J. Fowler	387,690.75	50,271.06
Difference between highest and lowest tenders		$98,500.13

Contract awarded to J. W. McManus Co., Ltd., August 23, 1907.
Date for completion, August 1, 1908.
Work commenced, October, 1907.
Security accompanying tender, 10 per cent, $28,919 cash.
Additional security called for, nil.
Security returned to contractor, December 22, 1911.
Gross amount of progress estimate to December 31, 1911, $587,081.01.
Amount of drawback retained on December 31, 1911, $11,295.85.
Percentage of contract complete to December 31, 1911, 99.76 per cent.

This short contract of eight miles contains a rather startling feature of construction, consisting of a cutting two miles in length at the summit of what is known as the Chipman grade. This cutting was made necessary by the strict adherence to the 0.4 per cent gradient and is dealt with further in another portion of the report.

The line here runs through the town of Chipman at Mile 57 and there crosses the Salmon river on a steel viaduct, 1,200 feet in length.

The quantities on this work were estimated by Mr. Guy C. Dunn from final location profiles.

The work was carried out in its entirety by the main contractors, no subcontracts being awarded.

CONTRACT No. 3.

From the 58th mile west of Moncton to the crossing of the C. P. R. at or about Mile 97.7. 39.7 miles, District A.
Chief Engineer's estimate of cost, $933,137.
Tenders advertised for February 1, 1908.
Tender received March 10, 1908.

SUMMARY OF TENDERS.

Grand Trunk Pacific Railway Company..... $767,484.95
Contract awarded to the Grand Trunk Pacific Railway Co., March 28, 1908.
Date for completion, September 1, 1910.
Work commenced, June, 1908.
Security accompanying tender, $75,000 cash.
Additional security called for, nil.
Security returned to contractor, November 25, 1910.
$50,000 of 10 per cent drawback paid contractor, November 25, 1910.
$50,000 of 10 per cent. drawback paid contractor, July, 1911.
Gross amount of progress estimate to December 31, 1911, $1,042,618.36.
Amount of drawback retained on December 31, 1911, $3,553.87.
Percentage of contract complete to December 31, 1911, 99.71 per cent.

The Grand Trunk Pacific Railway Company sublet this entire contract to the Toronto Construction Company under an agreement dated the 21st May, 1908, and that firm commenced operations the following month.

The terms of this agreement were similar to the other agreements consummated by the Grand Trunk Pacific Railway Company and provided for them a profit of five per cent of the total value of the work done.

The Toronto Construction Company had four firms of subcontractors who undertook the grading on this forty-mile stretch, and another firm of subcontractors for the concrete work. We are, however, advised by the Toronto Construction Company that their concrete subcontractors failed and they were obliged to finish the work themselves.

The following statement shows comparison between the rates contained in the main contract and those in the subcontracts which were awarded by the Toronto Construction Company:—

	Main contractors.	Sub-contractors.
Clearing	$50 per acre	$35 per acre
Grubbing	$160 " "	$185 " "
Solid rock, per cubic yard.....	$1.25	$1.05
Loose rock, per cubic yard.....	.44	.35
Ex. in foundations, per cubic yard.....	$1.00 and $3.00	.50
Cross logging, per acre.....	$800.00	$600.00
Timber for culverts	40.00 per M.	30.00 per M.
Concrete, 1-2-4 per cubic yard.....	13.00	10.00
Concrete, 1-3-5 per cubic yard.....	11.50	9.00
Concrete, 1-3-5 per cubic yard in arch culverts	13.00	9.00

The items enumerated above cover only those for which quantities have been returned in the contractors' progress estimates.

The estimates, compiled by the Investigating Commission from the records available showing the work performed by these subcontractors, give the following figures:—

Value of work done by subcontractors at their rates, $280,776.
Amount paid Toronto Construction Company for this work, $352,921.
Profit, $72,145.
Percentage of profit, 20 per cent.

Here allowance has been made for the five per cent profit which the Grand Trunk Pacific Railway Company received, so that the total percentage of profit between the original contractors and the subcontractors was 25 per cent.

The five per cent profit to the Grand Trunk Pacific Railway Company to December 31, 1912, amounts to $51,198. It will be noted that they were the only tenderers on this work and the Commissioners awarded them the contract in view of the fact that the estimate of the cost of the work, based upon their returns, was considerably lower than the estimate of the cost as prepared by the Chief Engineer. These estimates were compiled from those taken by District Engineer Dunn from the final location profiles. The increase in cost over the original estimate is due to the large quantity of over 275,000 cubic yards of train-hauled filling used in the construction of embankments and for which no provision was made in the original estimate, also, to the increase in the solid rock returns from 22,000 cubic yards as estimated to 84,000 cubic yards as finally paid for.

Contract No. 4.

From about Mile 97.7 west of Moncton to the Tobique River at about Mile 164.7. 67 miles, District A.

Chief Engineer's estimate of cost, $2,356,389.84.

Tenders advertised for February 1, 1908.

Tenders received March 10, 1908.

SUMMARY OF TENDERS.

		Difference between tenders.
Tender No. 1, Grand Trunk Pacific Railway	$1,898,124.21	
" No. 2, Macdonell & O'Brien	2,001,486.51	$103,362.30

Contract awarded to the Grand Trunk Pacific Railway, March 28, 1908.
Date for completion, September 1, 1910.
Work commenced, June, 1908.
Security accompanying tender, $100,000 cash.
Additional security called for, nil.
Security returned to contractor, November 25, 1910.
$150,000 of 10 per cent drawback paid contractors, November 25, 1910.
$110,000 of 10 per cent paid contractors, July, 1911.
Gross amount of progress estimate to December 31, 1911, $2,805,300.01.
Amount of drawback retained on December 31, 1911, $18,924.58.
Percentage of contract complete to December 31, 1911, 99.53 per cent.

This contract was sublet by the Grand Trunk Pacific Railway Company to the Toronto Construction Company under an agreement which provided a profit of five per cent to the main contractors. The Toronto Construction Company, in turn, sublet the grading and concrete work to four firms of subcontractors, and, in addition to the terms of these subcontractors, we have procured a series of copies of further sub-subcontracts by which this work was again sublet, and the following statement shows the comparison of these prices:—

	Main contractors.	Subcontractors.	Sub-subcontractors.
Clearing, per acre	$50	$45	$30
Grubbing, per acre	$150	$135	$100
Solid rock	$1.45	$1.25	$1 and $1.10
Loose rock	.45	.36	.30 and .38
Common excavation	.27	.23½ and .32½	.18
Timber for culverts	$40 per M.	$36 per M.	
Concrete, 1-2-4	$12	$10	
Concrete, 1-3-6	$10.50	$9.50	
Concrete, 1-3-6 in arch culverts	$11.00	$8.50	

These figures illustrate to a remarkable degree the extent of profit taking between the main contractors and the stationmen who actually performed the work.

To December 31, 1912, the five per cent profit to the Grand Trunk Pacific Railway Company on this contract amounted to $141,773.

The estimate for this work was prepared by Mr. Dunn from the profiles of the final location of the line.

The returns on this work show an increase over the original estimate of about $500,000. This increase is due to the item of train-hauled filling, which, in cost, exceeded the estimate by $274,000, to the solid rock returns which increased 100 per cent, and to other items, one of which is the engine house at the divisional point of Napadogan which has cost to date $96,000, and for which no allowance had been made in the engineer's figures.

CONTRACT No. 5.

From one mile east of Tobique River to about 2⅛ miles west of Grand Falls, N.B., being from Mile 163.80 to Mile 195.58 west of Moncton. 31.7 miles.

Chief Engineer's estimate of cost, $2,232,891.45.

Tenders advertised for February 1, 1908.

Tenders received March 10, 1908.

SUMMARY OF TENDERS.

		Difference between tenders.
Tender No. 2, Willard Kitchen Co., Ltd	$1,646,253.65	
" No. 6, Craig & Thompson	1,694,626.02	$ 48,372.37
" No. 5, M. P. & J. T. Davis	1,718,288.41	23,662.39
" No. 4, Kennedy & McDonald	1,757,483.19	39,194.78
" No. 3, Grand Trunk Pacific Railway	1,774,991.33	17,508.14
" No. 7, Macdonell & O'Brien	1,818,402.74	43,411.41
" No. 1, Trites, McPhail, Mavor & Miller	2,003,283.99	184,881.25
Difference between highest and lowest tenders		$357,030.34

Contract awarded to Willard Kitchen Co., March 28, 1908.
Date for completion, September 1, 1910.
Work commenced, May, 1908.
Security accompanying tender, $75,000 cash.
Additional security called for, nil.
$220,000 of 10 per cent drawback paid contractor, January, 1911.
$40,000 of 10 per cent drawback paid contractor, July, 1911.
Gross amount of progress estimate to December 31, 1911, $3,023,784.84.
Amount of drawback retained on December 31, 1911, $42,220.39.
Percentage of contract complete to December 31, 1911, 97.23 per cent.

The entire mileage of this contract was divided by the Willard Kitchen Company among twelve contractors for the grading and general work, while the concrete work was sublet to the firm of Powers & Brewer, who, in turn, sublet a portion of it to the firms of Farlinger & McDonald and Cavichi & Pagano.

The statement compiled by the Commission from the subcontractors' rates and their returns shows the following results:—

Value of work done by sub-contractors at their rates, $1,819,456.00.
Amount paid main contractors for this work, $2,518,927.00.
Profits, $699,481.00.
Percentage of profits, 27¾ per cent.

The following are the respective prices paid the main contractors and the various subcontractors for the items contained in the returns:—

	Main contractors.	Subcontractors.	Sub-subcontractors.
Clearing per acre	$42	$35	
Grubbing	$100	$75	
Solid rock, per cubic yard	$1.49	$1.25	
Loose rock, per cubic yard	.35	.30	
Common excavation	.24	.20	
Solid rock borrow	$1.10¼	.75	
Timber in culverts	$35	$25	
Tunnels	$98.30	$77.12	
Piles delivered per lin. ft.	.20	.08	
Piles driven per lin. ft.	.30	.18	
Concrete facing mixture	$20	$18.50	$12.75
Concrete 1-2-4	$15	$10	$9.75
Concrete 1-3-5	$11	$8.50	$7.75
Concrete 1-3-6	$10.50	$8	$7.25
Concrete 1-2-5	$11.50	$8.75	$8
Concrete 1-3-5 in arch culverts	$11.00	$9.50	$8.75
Concrete 1-3-6 in arch culverts	$10.75	$9	$8.25

The 31.7 miles covered by this contract shows a cost of over $130,000 per mile.

Mr. Dunn prepared the estimate for this work from the profiles of the final location. There were seven tenderers for this contract, which was the largest number of tenderers for any grading contract on the Transcontinental railway.

A comparison of the figures contained in the original estimate and the returns to date show that the large increase in cost is due principally to the items of solid rock, concrete work, and train hauled filling. These figures are:—

	In Estimate.	In Returns.
Solid rock	252,893 cub. yards	692,600 cub. yards
Concrete	21,956 cub. yards	34,801 cub. yards
Trainhauled filling	50,000 cub. yards	335,670 cub. yards

On this contract is located some of the very heaviest work experienced on District A. From the summit at Mileage 178, which is overcome by a tunnel, to Mileage 192, the cuttings and fills are exceedingly heavy, and, in addition to the excavation costs, within this mileage are located four steel viaducts, one at Graham Brook, 520 feet in length, one at Caton Brook, 1,060 feet in length, one at Little River, 1,242 feet in length, and the Salmon River viaduct at Mileage 184, 3,900 feet in length and some 225 feet high. This is the costly piece of construction on which one and three-quarter million dollars might have been saved, as outlined in the report on the Salmon River viaduct.

Contract No. 6.

From a point at or near Grand Falls, N.B., westerly to the Quebec-New Brunswick boundary, being from Mile 195.58 to 256.61 west of Moncton. 61.03 miles.

Chief Engineer's estimate of cost, $1,478,395.78.

Tenders advertised for January 5, 1907.

Tenders received February 14, 1907.

SUMMARY OF TENDERS.

		Difference between tenders.
Tender No. 1, Lyons & White	$1,385,941.09	
" No. 2, Grand Trunk Pacific Railway	1,407,349.41	$ 21,408.32
" No. 5, Toronto Construction Co	1,514,147.48	106,798.07
" No. 4, Eastern Construction Co., of Amherst, N.S.	1,516,269.04	2,121.56
" No. 3, Eastern Construction Co	1,639,306.02	123,036.98
" No. 6. J. W. McManus Co., Limited	1.641.681.46	2.375.44
Difference between highest and lowest tenders		$255,740.37

Contract awarded to Lyons & White, March 9, 1907.
Date for completion, September 1, 1908.
Work commenced, May, 1907.
Security accompanying tender, $90,000 cash.
Additional security called for, nil.
$100,000 of 10 per cent drawback paid contractor, April, 1909.
$100,000 of 10 per cent drawback paid contractor, July, 1911.
Gross amount of progress estimate to December 31, 1911, $2,409,112.80.
Amount of drawback retained on December 31, 1911, $40,911.28.
Percentage of contract complete to December 31, 1911, 94.86 per cent.

The grading work on this contract was sublet by Messrs. Lyons and White to seven firms of main subcontractors. A few minor sub-subcontracts were let, but in the main the work was carried out by these seven contractors.

The following list shows a comparison of the rates paid Messrs. Lyons and White and those paid the subcontractors for a few of the principal items of construction:—

	Main contractors.	Subcontractors.
Clearing per acre	$40.00	$30.00
Solid rock, per cubic yard	1.60	1.20
Loose rock, per cubic yard	.50	.40
Common ex. per cubic yard	.23	.18
Excavation in foundations, no cofferdams	1.00	.35
Excavation in foundations, with cofferdams	2.00	.50
Piling delivered per lin. ft	.25	.15
Pile driving per lin. ft	.15	.13
Concrete 1-2 mixture per cub. yard	16.00	12.50
Concrete 1-2-4	12.00	9.00
Concrete 1-3-5	10.50	7.50
Concrete 1-3-6	10.00	7.00
Concrete 1-3-5 in arch culverts	11.00	8.00
Concrete 1-3-6 in arch culverts	8.50	6.50
Train-hauled filling	.40	.35

A summary compiled from the subcontractors' returns and their rates shows a profit of 19¾ per cent for Messrs. Lyons and White on this work.

The yardage of material in excavation and embankments was very greatly in excess of the estimate prepared by District Engineer Dunn. The item for train-hauled filling alone has increased the cost by $227,000.

CONTRACT No. 7.

From the Quebec-New Brunswick boundary, westerly, being from Mile 256.61 to 310.22. 53.61 miles.

Chief Engineer's estimate of cost, $3,139,367.00.
Tenders advertised for February 1, 1908.
Tenders received, March 10, 1908.

SUMMARY OF TENDERS.

		Difference between tenders.
Tender No. 2, M. P. & J. T. Davis	$2,377,409.00	
" No. 1, O'Brien & Fowler	2,512,488.80	$135,079.80
" No. 3, Grand Trunk Pacific Railway	2,608,099.75	95,611.45
Difference between the highest and lowest tender		$230,690.75

Contract awarded to M. P. & J. T. Davis, March 28, 1908.
Date for completion, September 1, 1910.
Work commenced, June, 1908.
Security accompanying tender, $100,000 cash.
Additional security called for, nil.
$200,000 of 10 per cent drawback paid contractor, January, 1911.
$10,000 of 10 per cent drawback paid contractor, July, 1911.
Gross amount of progress estimate to December 31, 1911, $2,529,912.41.
Amount of drawback retained on December 31, 1911, $42,046.70.
Percentage of contract completed to December 31, 1911, 71.40 per cent.

The estimate on which this contract was awarded was compiled from first location profiles.

Work was commenced by Messrs. Davis, in June, 1908, but has not been conducted with sufficient vigor or diligence to ensure early completion, being only 71.4 per cent complete on December 31, 1911, a year and four months after the date set for completion.

The delay in the progress of work on this contract and the eastern end of contract No. 8, which might have been reached earlier had contract No. 7 been further advanced, has undoubtedly been the cause of delay to the completion of the through railway from Levis to Moncton. On December 31, 1911, contracts Nos. 1, 2, 3, 4 and 5 were reported 90 per cent complete, and contract No. 6, 88.7 per cent complete, while the work on contract No. 7 was only 62.8 per cent complete. We feel that these being the conditions the enforcement of the penalty clause would have had, perhaps, salutary effect, and that at this date the penalising of the contractor for twelve months' delay at $5,000 per month and the reduction of his profits by this sum of $60,000 would be an inadequate compensation for the delay to the opening of the through line of railway.

The following list shows a comparison between the main contractors' rates and those paid the subcontractors:—

	Main contractor.	Subcontractor.
Solid rock, per cubic yard	$ 1.45	$ 1.24
Loose rock, per cubic yard	.50	.40
Common ex., per cubic yard	.24	.22
Concrete 1-2-4 mixture	13.00	10.75
Concrete 1-3-5 mixture	10.00	8.10
Concrete 1-3-6 mixture	9.50	7.60
Train-hauled filling	.40	.28

And while no statement has been compiled showing the approximate profits realized, at the rates shown for main and subcontractors, the item of train-hauled filling alone would have provided a profit of over $225,000.

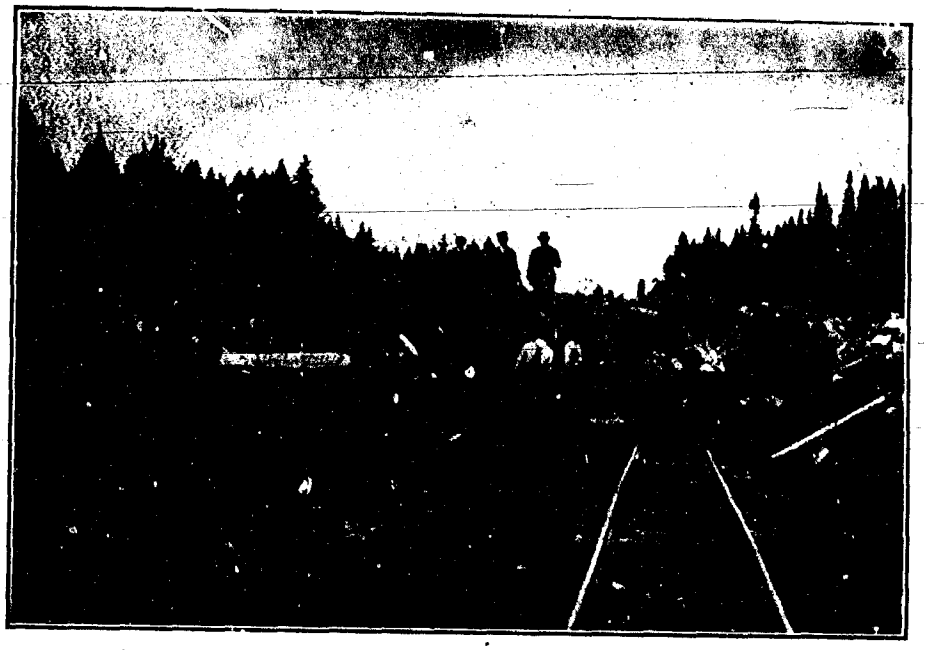
CONTRACT No. 8.

From a point at or near the Quebec Bridge, easterly about 150 miles, being from mile 310.22 to 460.45. 149.13 miles. Quebec Bridge—1.11 miles.

Chief Engineer's estimate of cost, $5,491,974.00.

Tenders advertised for January 5, 1907.

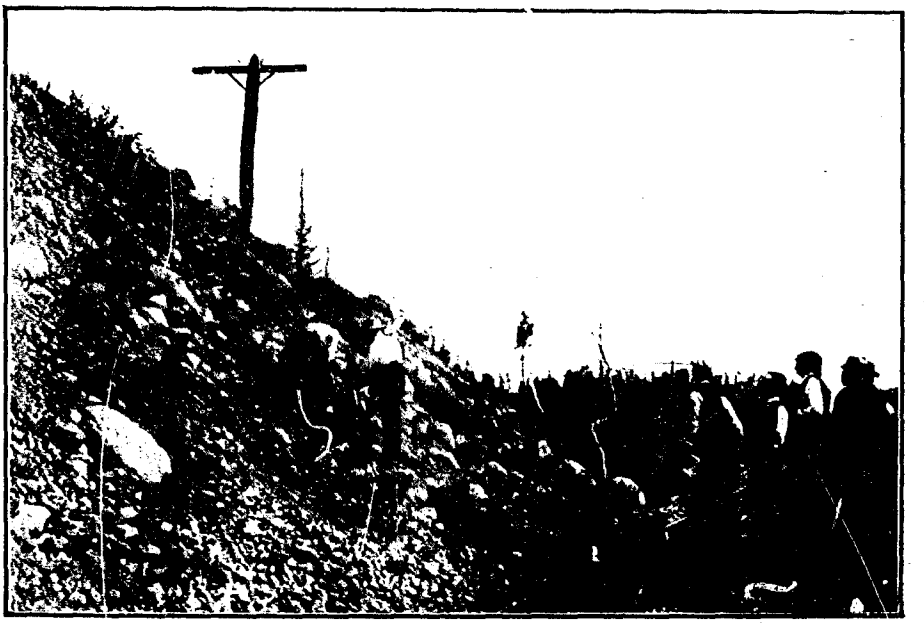
Tenders received February 14, 1907.



District B, Residency 45, Mileage 97 0. End of Grading, August 14 1912 Page 42

District F, Residency 21, Mileage 24.6. Waste. Page 60.

District B, Residency 30, Mileage 162.3. Assembled Rock. Page 66.



District B, Residency 32, Mileage 174.7. Assembled Rock. Page 66.

SUMMARY OF TENDERS.

		Difference between tenders.
Tender No. 4, M. P. & J. T. Davis	$5,011,346.50	
" No. 3, Grand Trunk Pacific Railway	5,018,554.80	$ 7,208.30
" No. 2, O'Brien & Mullarkey	5,169,745.05	151,190.25
" No. 1, Russell, Chambers, Limited	5,213,542.50	43,797.15
Difference between highest and lowest tenders		$202,195.70

Contract awarded to M. P. & J. T. Davis, March 9, 1907.
Date for completion, September 1, 1909.
Security accompanying tender, $225,000 cash.
Additional security required, nil.
$300,000 of 10 per cent drawback paid contractor, December, 1908.
$250,000 of 10 per cent drawback paid contractor, January, 1911.
$10,000 of 10 per cent drawback paid contractor July, 1911.
Gross amount of progress estimate to December 31, 1911, $6,341,955.99.
Amount of drawback retained on December 31, 1911, $64,405.94.
Percentage of contract completed to December 31, 1911, 80.17 per cent.

The first statement prepared by the Chief Engineer of the estimated cost of this contract, was completed on January 18, 1907, and amounted to $5,491,974, which was a compilation of the estimated quantities as submitted by the District Engineer. Tenders were advertised for on January 15, 1907, and were received and opened on February 14. Prior to the opening of the tenders, the Chief Engineer revised these original estimates by the addition of the following items, for the reason as given by Mr. Lumsden that he thought they would require some trestles in that portion of the country covered by this contract:—

Item 24, Framed Trestles	732,190 F. B. M.
Item 26, Sawn Ties and Guard Rail	166,600 F. B. M.
Item 27, Stringers	192,780 F. B. M.
Item 96, Iron in Drift Bolts	8,109 No.
Item 97, Iron in Screw Bolts	38,887 No.
Item 99, Cast Iron Washers and Separators	27,560 No.

On January 23rd, the Chairman of the Commission, Mr. Parent, was supplied with copies of the Chief Engineer's estimates of the cost of the five contracts for which tenders closed on February 14, one of which is Contract No. 8. The estimate for contract No. 8, which he received, was a copy of the original estimate, and did not contain the items covering the construction of trestles noted above. (Page 409.)

The tenders for this contract were opened on February 14, and on the afternoon of February 15, the list of prices contained in the various tenders was handed the Chief Engineer's office, so that they might be moneyed out, according to the estimated quantities.

If these tenders had been moneyed out by the revised estimate, which contained the items for the construction of trestles, the result would have been as follows:

		Difference between tenders.
Grand Trunk Pacific Railway	$5,078,334.77	
M. P. & J. T. Davis	5,105,389.24	$ 27,044.47
O'Brien & Mullarkey	5,245,586.55	140,197.31
Russell & Chambers Co.	5,269,671.22	24,084.67
Difference between highest and lowest tenders		$191,326.45

and the Grand Trunk Pacific Railway Company would have been the lowest tenderer by $27,044.47.

However, before these results were announced, the chairman, having learned that after he had received copies of the engineer's estimate it had been revised by the addition of the items for the construction of wooden trestles, directed the Chief and Assistant Chief Engineers to strike out these items and to rewrite the estimate, leaving these items blank.

After they were amended and rewritten, the chairman caused the rewritten copies to be signed by the Chief Engineer, Hugh D. Lumsden, and the Assistant Chief Engineer, Duncan MacPherson. (See exhibit No. 27.) These signatures were dated 18th February, 1907, but the figure "1" of the "18th" has been erased to make it appear that these signatures were affixed to this estimate on the 8th of February, 1907. On the 8th of February, Mr. Lumsden was not in Ottawa, in fact, but was in Winnipeg, as he has sworn (p. 408); and as appears by entries in his diary, produced before the Commission. Mr. MacPherson states (see exhibit No. 28) that this was signed by Mr. Lumsden and himself on the 18th of February, and that Mr. Lumsden left for Winnipeg on the 5th of February, and returned on February 13. The tenders were opened by the Commissioners on the 14th and 15th of February, so that the Chairman on the 18th knew what the tenders were.

In their tender, M. P. & J. T. Davis asked for item 24, framed trestles, $80 per m.f.b.m; item 26, sawn ties and guard rail, $80 per m.f.b.m.; item 27, stringers, $85 per m.f.b.m.; while the Grand Trunk Pacific Railway Company asked $50, $45 and $60 per m.f.b.m. respectively for these three items. Had the chairman not ordered the estimates for these three items to be struck out the standing of the tenders would have been as follows:—

Grand Trunk Pacific Railway	$5,078,334.77
M. P. & J. T. Davis	5,105,339.24
O'Brien & Mullarkey	5,245,558.55
Russell & Chambers	5,298,671.22

It will be seen from the above that the Grand Trunk Pacific Railway would have been $27,044.47 lower in their tender than M. P. & J. T. Davis. It was, therefore, essential if M. P. & J. T. Davis were to receive this contract that items 24, 26 and 27 should be struck out.

No legitimate reason can be adduced why the chairman should direct these items to be struck out of the estimates. The price which M. P. & J. T. Davis asked for these items is double that which any of their competitors asked and is double what it was worth to supply the timber, and it is not reasonable to suppose that had they expected that this timber would figure largely in the engineer's estimate, that they would have made such preposterous figures for this timber. Some person with a guilty mind erased the figure "1" from the date on the estimate and that person clearly erased that figure for the purpose of making it appear that that estimate sheet was signed before the tenders were received and opened.

Mr. S. N. Parent, who was chairman of the Commission at the time these contracts were let, gave evidence on this investigation, and he was shown all the documents above mentioned and was informed of what Mr. MacPherson and Mr. Lumsden said in regard to the matters above spoken of.

He said that he did not order the Chief Engineer to strike out the estimates for the timber:—

> "I never did that; on the contrary, we obliged them to have them in." (Page 619.)

He said, when he was giving his evidence (page 621), that this was the first time he had seen the estimates signed by Lumsden and MacPherson, and the evidence then continues:—

"Q. Mr. Lumsden was not here on the 8th February at all; he was, as he swears, at Kenora on the 8th February, and some person has altered his signature so as to make it appear that he signed that document before the tenders were in for that contract, while, as a matter of fact, he signed it after the tenders came in. Do you say you know about that?—A. I never knew anything about that. I know nothing about it. For my part, I am prepared to swear now it is the first time I saw that document. If the alteration which you state there has been done, I am perfectly well convinced that it has been done since I resigned here. They have the new administration going on and they try to find fault with the last administration."

The document was filed as Exhibit A., in Mr. Parent's evidence. (See Exhibit No. 27.) He was further asked:—

"Q. As a matter of fact did the Davises see these estimates, to your knowledge?—A. I cannot say that.

"Q. Do you know whether they did or not?—A. I do not think so, for this reason, that I do not recollect at all the changes that MacPherson and Lumsden speak about.

"Q. Did you show the Davises this estimate?—A. I cannot say that. If it occurred to me and I thought it was in the public interest to do so, I would have done so. Davis may have seen it, or the Grand Trunk may have seen it, or somebody else may have seen it, but I gave no preference to Davis or anyone else.

"Q. I understand that, but I want to know now if you remember whether or not this estimate was shown to the Davises?—A. I cannot swear.

"Q. You do not know whether they were or not?—A. I cannot swear that.

"Q. You do not know whether you showed them or not?—A. If I did the others must have seen them too.

"Q. Do you remember whether you showed Mr. Davis?—A. I cannot say as to that. There were so many things going on in the Commission that I could not recollect a special thing like that. We refused to give quantities to a contractor from the start because by doing so we might get into trouble."

It will be observed that Mr. Parent states that he did not instruct the elimination of the estimates for timber but that he caused them to be inserted. We think he must be mistaken in this or he certainly would have understood when the tenders moneyed out were brought before him, that the engineers, after having amended the estimates in that respect had again struck them out and would have restored them.

Though he testifies that he had never seen the document on which the date has been altered from 18th February, 1907, to 8th February, 1907, he will not directly pledge his oath that he gave no information respecting these estimates to the successful tenderers. Mr. M. P. Davis in his evidence positively denies that he has seen these estimates.

Whatever may be the proper inference from this evidence, there can be no doubt:—

1. That originally there was no estimate for timber trestles.
2. That the Commissioners had a copy of the signed estimate.
3. That the engineers, before the tenders were opened, had added an estimate for timber trestles.
4. That on 18th February, 1907, after the tenders were opened, the estimates for timber trestles were struck out.

5. That had the estimate for timber trestles not been struck out, the Grand Trunk Pacific Railway Company would have been the lowest tenderer and would have been awarded contract No. 8.

6. That some person, for some sinister purpose, has altered the date on the document, "Exhibit A" in Mr. Parent's evidence, from 18th February, 1907, to 8th February, 1907, and that the fair conclusion is that that person altered that date for the purpose of making it appear that these amendments to the estimates had been stricken out before the tenders were received.

The firm of M. P. & J. T. Davis, therefore, secured this contract, and the work was proceeded with. The great portion of the grading work on this contract was sublet to various contracting firms, and the following comparative statement shows the prices paid the main contractors and the average prices paid the sub-contractors for a few of the principal items:—

	Main contractors.	Subcontractors.
Item 4, solid rock	$ 1.45	$ 1.26
Item 5, Loose rock	.65	.42
Item 6, common excavation	.27	.22
Item 59, concrete 1-2-4	15.00	11.00
Item 62, concrete 1-3-5	10.50	8.15
Item 63, concrete 1-3-6	10.00	7.60
Item 74c, train filling	.45	.29

We have been unable to compile accurate statements showing the profit-taking on this entire contract. The item for train-hauled filling, however, of which there was 2,700,000 cubic yards, at the rates paid the main and sub-contractors, would indicate a profit on this item alone of $432,000.

There is no doubt that it was a very profitable contract.

Contract No. 9A.

For construction of railway from the northern approach to the Quebec bridge to the Champlain Market in the City of Quebec, a distance of about 6.38 miles; and

A terminal revetment wall of timber crib substructure with concrete wall superstructure to extend from a point on the river front just east of the Champlain Market site in a westerly direction, a distance of approximately 1,930 feet.

Contract awarded to M. P. & J. T. Davis.
Contract dated April 5, 1911.
Date for completion, January 1, 1914.
Security accompanying contract, nil.
Gross amount of progress estimate to December 31, 1911, $419,422.06.
Amount of drawback retained on December 31, 1911, $31,942.21.

This contract covers the portion of the work which was included in that being undertaken by the Quebec Bridge Company before the disaster to the Quebec bridge.

The Government took over that work and found that M. P. & J. T. Davis had a contract with the Quebec Bridge Company for the construction of the necessary approach tracks to the Quebec bridge. This contract was then transferred to the Commissioners of the National Transcontinental railway, and its scope is somewhat extended, so as to join up the City of Quebec with the Quebec bridge and Transcontinental railway.

The contract recites that it is given to the contractors in lieu of that held by them from the Quebec Bridge Company. It was not for that reason advertised for public competition.

CONTRACTS NOS. 9 AND 10.

(*Contract No.* 9)

From the Quebec Bridge westerly 50 miles—mileage 460.45 to 510.31= 49.86 miles.

Estimate on basis of lowest tender (see note below.)
Gross amount of progress estimates Dec. 31st, 1911—$2,660,000.41.
Contract dated May 15th, 1906 (with Hogan & Macdonell.)
Security deposit $225,000.00; returned Oct. 17th, 1910.
$85,000.00 a/c drawback paid M. P. & J. T. Davis April 6th, 1908.
$50,000.00 a/c drawback paid M. P. & J. T. Davis Dec. 5th, 1908.
Amount of drawback held Dec. 31st, 1911—$47,005.84.
Percentage of contract completed Dec. 31st, 1911—80.42 per cent.
$80,000.00 a/c drawback paid July, 1911.

(*Contract No.* 10)

From 50 miles west of Quebec Bridge westerly 100 miles, mileage 510.31 to 610.41=100.10 miles.

Chief Engineer's estimate of cost (See note below.)
Estimate on basis of lowest tender (See note below.)
Gross amount of progress estimates Dec. 31, 1911=$9,489,472.67.
Contract dated May 15, 1906 (with Hogan & Macdonell.)

NOTE:—The above contracts were assigned by Hogan & Macdonell.
Contract No. 9 to M. P. & J. T. Davis.
Contract No. 10 to Macdonell & O'Brien.

SUMMARY OF TENDERS.

No. 7—Hogan & Macdonell	$5,297,257.00
No. 8—O'Brien & Mullarkey	5,550,204.00
No. 6—G.T.P. Railway Co	6,459,538.00
No. 5—M. P. & J. T. Davis	6,677,598.00
No. 10—Connolly, Jardine & Wilson	7,031,001.00
No. 9—MacArthur Construction Co	7,940,325.00
Chief Engineer's estimate	6,172,827.05

Security deposit, $569,588.00; returned September 23, 1908.
$300,000.00 account drawback paid, April 6, 1908.
$250,000.00 account drawback paid, December 5, 1908.
$125,000.00 account drawback paid, July 28, 1910.
Amount of drawback held December 31, 1911=$34,622.45.
Percentage of contract completed, December 31, 1911=96.20 per cent.
$125,000.00 account drawback paid, July, 1911.
Advertisement dated February 8, 1906.
Tenders received, March 12, 1906.

CONTRACT No. 9.

M. P. & J. T. Davis.

From the Quebec Bridge, westerly 50 miles. Mileage 460.45 to 510.31. 49.86 miles.

Contract dated May 15, 1906.
Date for completion, September 1, 1907.
Work commenced June, 1906.
Security deposit $225,000, returned to Messrs. Davis, October 17, 1910.
$85,000.00 of 10 per cent drawback paid contractors April 6, 1908.
$50,000.00 of 10 per cent drawback paid contractors December 5, 1908.
$80,000.00 of 10 per cent drawback paid contractors July, 1911.
Amount of drawback retained on December 31, 1911, $47,005.84.
Percentage of contract complete to December 31, 1911, 80.42 per cent.

This contract extended from the Quebec Bridge, westerly about 50 miles. The Quebec divisional yard, roundhouse, etc., which are located immediately north of the Quebec Bridge, are included in this contract.

This divisional yard has been called "bridge" to distinguish it from any other station which may be erected in the City of Quebec proper.

The features on this contract are the large double track cutting at Cap Rouge, and the Cap Rouge Viaduct, both of which are dealt with further in another portion of this report.

The work on this contract was generally sublet by Messrs. Davis, and the following figures show the main contractors' rates and the average prices paid to subcontractors for a few of the principal items of construction:

	Main Contractors.	Subcontractors.
Solid rock per cubic yard	$1.50	$1.25
Loose rock per cubic yard	.50	.40
Common ex. per cubic yard	.21	.18
Concrete 1-2-4 mixture	12.00	8.25
Concrete 1-3-6 mixture	10.00	6.75
Concrete 1-3-6 in arch culverts	10.00	7.75

No statement of approximate profits has been compiled for this contract on account of the difficulty experienced in procuring accurate records of subcontractors' prices and quantities.

About 790,000 cubic yards of trainhauled filling have been returned to December 31, 1912, at the rate of fifty-five cents per cubic yard, and, at the rates which this work was sublet by Messrs. Davis on Contracts Nos. 7 and 8, these figures would indicate a profit to the main contractors of $200,000.00 on this item alone.

Contract No. 10.

Macdonell & O'Brien.

From 50 miles west of the Quebec Bridge, westerly 100 miles. Mileage 510.31 to 610.41. 100.10 miles.

Contract dated May 15, 1906.
Date for completion, September 1, 1907.
Work commenced June, 1906.
Security deposit $569,588.00 returned to Macdonell & O'Brien, September 23, 1908.
$300,000.00 of 10 per cent drawback paid contractors April 6, 1908.
$250,000.00 of 10 per cent drawback paid contractors December 5, 1908.
$125,000.00 of 10 per cent drawpaid paid contractors July 28, 1910.
$125,000.00 of 10 per cent drawback paid contractors July, 1911.
Amount of drawback retained on December 31, 1911, $34,622.45.
Percentage of contract complete to December 31, 1911, 96.20 per cent.

The grading work on this 100 miles was divided among about a dozen firms of subcontractors, and the concrete work was sublet in like manner.

The following list shows the rates paid the main contractors and the average prices paid subcontractors for a few of the principal items of construction:

	Main Contractors.	Subcontractors.
Solid rock per cubic yard	$1.50	$1.30
Loose rock per cubic yard	.50	.40
Common ex. per cubic yard	.21	.18
Concrete 1-2-4	12.00	9.79
Concrete 1-3-5	11.00	8.71
Concrete 1-3-6	10.00	8.43
Trainhauled filling	.55	.40
Piling delivered	.20	.16
Piling driven	.40	.16

The statement compiled by this Commission, based on these prices and the subcontractors' returns, show the following results:

Value of work done by subcontractors at their rates $5,540,571.72.
Amount paid main contractors at their prices for this work, $7,088,266.24.
Profit, $1,547,694.52.
Percentage of profit, 21 3-4 per cent.

There has not been included in these figures any yardage of trainhauled filling as the returns from the District Engineer's office do not show that any of this work was handled by subcontractors. Messrs. Macdonell & O'Brien, however, in statements submitted by them, give the average price paid subcontractors for this item as forty cents, and assuming that they could handle the work themselves for this rate on the 3,577,960 cubic yards returned under this heading, a profit would be realized of $536,000.00.

In connection with the further subletting of this work, we have been supplied with subcontracts to stationmen, under which agreements the men who actually performed the excavation of the cuttings were paid for solid rock excavation, ninety cents per cubic yard, and for loose rock excavation, twenty-five cents per cubic yard, and for common excavation, fifteen cents per cubic yard. From the records which we have been supplied with, we find that these are the lowest figures paid to stationmen for grading work of any character.

The prices at which Messrs. Macdonell & O'Brien sublet the work has a direct bearing upon several features in the report to which it is well to call attention. The price per cubic yard for trainhauled filling, we have contended, was excessive, and the quantity handled at these prices was unnecessary. The large profits indicated by these returns are conclusive proof of the desirability of limiting, by every expedient possible, the extent of this, to the main contractors, highly lucrative work.

Attention is also drawn to the prices paid by Messrs. Macdonell & O'Brien for the items of 'Piling Delivered' and 'Piling Driven.'

The increase in quantities on this contract over the engineers' estimated quantities are as follows:

	In Estimate	In Returns
Solid rock	779,433 cu. yds.	2,712,359 cu. yds.
Loose rock	211,200 cu. yds.	1,513,284 cu. yds.
Common excavation	4,242,455 cu. yds.	1,501,803 cu. yds.
Train fill	Nil.	3,577,960 cu. yds.

In connection with the largely increased cost of work on this contract, we cannot do better than quote here from the explanation of this increased cost as applying to District "B," given by Mr. Gordon Grant in a report of the Commissioners to the Honourable George P. Graham, dated April 11, 1910, and printed in column 8356 of Hansard for April 23, 1910. The memorandum is as follows:

Remarks as to District "B"—

"Some of the reasons counting for the apparent inaccuracy of the estimates of quantities made before the opening up of the work and the award of the contracts in this district are as follows:

"(1) In the case of the 150 miles from the north abutment of the Quebec Bridge, westerly, Contracts Nos. 9 and 10, the surveys were not completed before the contracts were awarded, and the estimates of quantities were based partly on first location lines, partly on preliminary, and fifty miles on projected lines, the demand for the estimates being made by the Chief Engineer; on revising the work, errors in levels were found requiring a change of line in several places and heavier work to get a 0.4 per cent grade; the opening up of the work disclosed a vast quantity of mixed material not provided for in the estimated quantities. No allowance was made for train filling where common excavation borrow could not be obtained. The estimates were based on the use of velocity grades, the elimination of which increased the quantities greatly. The estimates were made on the order of the Chief Engineer before sufficient information had been obtained regarding the rise and fall of some of the streams encountered, and this, in some cases, required the subsequent raising of the grade and an increase in the quantities, thus adding to the cost both of the grading and the bridges; the location lay along steep side hills in many cases, thus adding to the difficulty of making accurate estimates of quantities cross sections not having been taken; (2) many of the above reasons apply to the district generally and test pits were not as a rule dug in cuttings."

CONTRACT No. 11.

From about La Tuque to Weymontachene, P.Q., being from Mile 610.41 to 656.83. 46.42 miles.

Chief Engineer's estimate of cost, $1,776,280.00.

Tenders advertised for January 5, 1907.

Tenders received February 14, 1907.

SUMMARY OF TENDERS.

		Difference between tenders
Tender No. 1 Grand Trunk Pacific Railway.....	$1,691,073.41	
Tender No. 2 Macdonell & O'Brien	1,951,905.74	$260,832.33
Tender No. 3 Russell, Chambers, Ltd.	2,033,711.23	81,805.49
		$342,637.82

Contract awarded to the Grand Trunk Pacific Railway Co. March 14, 1907.
Date for completion, September 1, 1908.
Work commenced November, 1907.
Security accompanying tender, $75,000.00 cash.
Additional security called for, nil.
Security returned to contractor June 7, 1910.
$175,000.00 of 10 per cent. drawback paid contractor July, 1910.
$120,000.00 of 10 per cent. drawback paid contractor July, 1911.
Gross amount of progress estimate to December 31, 1911, $3,168,162.95.
Amount of drawback retained on December 31, 1911, $20,465.00.
Percentage of contract complete to December 31, 1911, 97.19 per cent.

This contract was assigned by the Grand Trunk Pacific Railway Company to Messrs. Macdonell & O'Brien on the 21st March, 1907, the Grand Trunk Pacific retaining as their profit on the transaction five per cent of the total returns, which, to December 31, 1912, amounted to $158,365.00.

The first return to the contractors on this contract was in the month of November, 1907, or eight months after the contract had been awarded.

The location of these forty-six miles would apparently justify the increased rates paid for excavation as compared with the prices on Contracts Nos. 9 and 10, as the work was in a rather inaccessible part of the country until Contract No. 10 was sufficiently completed to permit of supplies, etc., being brought by rail right on to the work, and the delay of eight months from the date the contract was awarded to the first return made by the contractors, was apparently due to difficulty in getting in touch with the work. The increase in the rates for excavation is, in our opinion, a sufficient compensation to the contractor for the inaccessibility of the work, and the increased profits made possible by these rates should have been expended upon the construction of roads, etc., and in other means taken to complete the organization for this contract so that the work could have been commenced within a month of the date of the awarding of the contract.

The enforcement of the penalty clause, which provides a refund of $5,000.00 a month for delay of this character, we consider applicable to the first seven months of delay, though a reduction in the contractor's profits of $35,000.00 would be small compensation to the Commission for the loss sustained by them.

It will be noted from the summary of tenders that Messrs. Macdonell & O'Brien, who subsequently carried out this work, submitted, originally, a bid which monied out $260,832.00 higher than that of the Grand Trunk Pacific Railway Company, and, in the carrying out of the work, they were satisfied to accept prices five per cent lower than the successful tender, or, in other words, the rates at which they were eventually paid for this work were about eighteen per cent lower than the prices which they submitted in open competition. This point strikes us as being a very positive proof of the fact that the contractors tendering on this work were not influenced in submitting their bids by any fear of keen competition. A contractor desirous of obtaining the work would not submit a bid from which eighteen per cent might be deducted and still permit him to make the profits which the statements for this contract show to have existed, if he had any reason to believe that the work would be the subject of keen competition from a number of contracting firms.

The following statement shows, for a few of the principal items, the rates contained in the main contract and the average rates paid subcontractors who performed the work, and Macdonell & O'Brien sublet to a considerable extent the grading and concrete work.

	Main Contractors.	Subcontractors.
Solid rock per cubic yard	$1.65	$1.13½
Loose rock per cubic yard	.60	.45
Common ex. per cubic yard	.27	.20
Concrete 1-3-5 mixture	12.00	9.50
Concrete 1-3-6 mixture	11.00	8.90
Concrete 1-2-4 mixture	13.00	10.37
Concrete 1-2 mixture	14.00	10.37
Train fill	.50	.42½

From the subcontractors' returns and their rates, the Commission have compiled the following statement:

Value of work done by subcontractors at their rates, $1,449,624.71.
Amount paid Messrs. Macdonell & O'Brien for this work, $2,147,790.58.
Profit, $698,165.87.
Percentage of profit, 32 per cent.

The fact that Messrs. Macdonell & O'Brien suffered a reduction from their original bid of eighteen per cent, and at those reduced prices were in a position to sublet the work so advantageously, is an indication of the free and confident manner with which the original bids were prepared and submitted.

CONTRACT No. 12.

From a point at or near Weymontachene, westerly, being from Mile 656.83 to 763.83. 107 miles.

Chief Engineer's estimate of cost, $5,715,892.33.

Tenders advertised for July 18, 1908.

Tenders received August 20, 1908.

SUMMARY OF TENDERS.

		Difference between tenders.
Tender No. 1, Macdonell & O'Brien	$4,599,284.50	
Tender No. 2 M. A. & J. T. Davis	4,883,713.50	$324,429.00

Contract awarded to Macdonell and O'Brien September 19, 1908.
Date for completion, December 31, 1910.
Work commenced February, 1909.
Security accompanying tender, $150,000.00 cash.
Additional security called for, nil.
Security returned to contractor July, 1910.
$150,000.00 of 10 per cent drawback paid contractor February, 1911.
$80,000.00 of 10 per cent drawback paid contractor July, 1911.
Gross amount of progress estimate to December 31, 1911, $4,194,878.09.
Amount of drawback retained on December 31, 1911, $189,487.80.
Percentage of contract completed to December 31, 1911, 64.69 per cent.

In addition to the two tenders shown in the summary of tenders for this work, the Grand Trunk Pacific Railway Company submitted a proposal to undertake and complete this contract on the basis of cost plus ten per cent and as outlined in the following letter which they submitted with their tender:

August 19, 1908.

The Commissioners of the Transcontinental Railway,
Ottawa, Ontario.

Gentlemen:

The Grand Trunk Pacific Railway Company hereby tender on the work or District "C," from a point designated on the plans of the Commissioners near Weymontachene, in the Province of Quebec, 196.38 miles west of the north abutment of the Quebec Bridge (such point being on the boundary between districts "C" and "D"), westerly for a distance of about 107 miles,—date of completion 31st December, 1910,—on the basis of cost plus 10 per cent, guaranteeing, should the tender be accepted, to give the company's bond with security satisfactory to the Commissioners and the Government.

The reason for taking the liberty to depart, in making this tender, from the rules laid down by the Commissioners of the Transcontinental Railway governing such tender, is that the Grand Trunk Pacific Railway Company is interested beyond anyone else in keeping the cost of this Section down to the lowest possible point that will ensure its being completed in accordance with the standards prescribed, because of the fact that under its agreement with the Government the Grand Trunk Pacific ultimately become responsible for the interest charge, also owing to meagre information furnished by the Commissioners relative to the character of the material to be handled, and the quantities of the several kinds of materials, and the cost of transportation of supplies, material and equipment, which will be one of the large items, due to the great inaccessibility of the work, and realizing that this condition appeals to all practical contractors and that they will, therefore, in fact must put in a figure that will make them safe, which we feel will result in an excessive cost, unless the Commissioners will view the situation as we do and see their way clear to award to the Grand Trunk Pacific the work under the conditions above mentioned and, in case they have not the power, to obtain such power from the Government.

Yours truly,

FRANK W. MORSE,
Vice-President and General Manager.

As this proposal was not in accordance with the terms and conditions under which this work was to be awarded, and was not accompanied by any cheque as called for in the advertisement for tenders, it was not considered by the Commissioners, nor did they take any action thereon.

This work was awarded to Messrs. Macdonell & O'Brien, who, in turn, sublet the grading, etc., at the rates shown in the following comparative statement:

	Main Contractors.	Subcontractors.
Solid rock per cubic yard	$1.60	$1.30
Loose rock per cubic yard	.57	.45
Common ex. per cubic yard	.22	.20
Concrete 1-2 mixture	15.00	10.75
Concrete 1-2-4 mixture	14.00	10.75
Concrete 1-3-5 mixture	13.00	9.31
Concrete 1-3-6 mixture	12.00	9.12

This statement, based on these rates and the work returned for the subcontractors, gives the following figures:

Value of work done by subcontractors at their rates, $1,958,573.24.
Amount paid main contractors for this work, $2,502,046.01.
Profit, $543,472.77.
Percentage of profit, 21 3-4 per cent.

The penalty clause of five thousand dollars a month is applicable to the five months' initial delay in the commencement of work on this contract.

Contract No. 13.

From 107 miles west of Weymontachene, westerly for 114.97 miles, being from Mile 763.83 to 878.80. 114.97 miles.

Chief Engineer's estimate of cost, $4,007,326.73.
Tenders advertised for July 18, 1908.
Tenders received August 20, 1908.

SUMMARY OF TENDERS.

		Difference between tenders.
Tender No. 1, Macdonell & O'Brien	$3,815,279.10	
" No. 2, M. P. & J. T. Davis	3,876,377.60	$61,098.50

Contract awarded to Macdonell & O'Brien, September 19, 1908.
Date for completion, December 31, 1910.
Work commenced, December, 1911.
Security accompanying tender, $150,000.00.
Additional security called for, nil.
Gross amount of progress estimate to December 31, 1911, $1,194.00.
Amount of drawback retained on December 31, 1911, $119.40.
Percentage of contract complete to December 31, 1911, 0.02 per cent.

The 115 miles comprising this contract is located in the most inaccessible portion of the country between Cochrane and Quebec.

The Grand Trunk Pacific Railway Company submitted a tender on this work, their proposal being to complete this contract at cost plus 10 per cent, in accordance with the letter which they submitted with a similar proposal for Contract No. 12. The proposal was not, however, considered by the Commissioners of the Transcontinental Railway.

The contract was awarded to Messrs. Macdonell & O'Brien on September 19, 1908, and the first payment made for work done was in the month of December, 1911, three years and two months after the contract had been awarded, and one year after the date set for completion.

The following list shows the comparison between the rates paid the main contractors for a few of the principal items, and the rates at which they sublet this work:

	Main contractors.	Subcontractors.
Solid rock, per cubic yard	$1.80	$1.45
Loose rock, per cubic yard	.65	.50
Common ex., per cubic yard	.35	.25
Piles delivered per lin. ft	.25	.20
Piles driven per lin. ft	.25	.20
Timber for culverts per M. F. B. M	50.00	30.00
Concrete 1-2 mixture	18.00	14.00
Concrete 1-2-4 mixture	16.00	14.00
Concrete 1-3-5 mixture	16.00	12.00
Concrete 1-3-6 mixture	15.00	11.00

From the quantities returned for the subcontractors at these rates, and which represent, of course, only a small proportion of the work on account of the late start made, a profit of twenty and a third per cent is shown to have been realized by the main contractors.

We consider that the Commissioners of the Transcontinental Railway did not take a firm enough stand with the contractors with regard to the commencement of work on those contracts in isolated parts of the country.

The rates paid for excavation are higher than those prevailing either east or west of Contract No. 13, and should have been compensation to the contractor for any extra expense he would be put to on account of the difficulty experienced in getting to the work prior to the completion of the line and the laying of the rails on either side of this 115 mile stretch.

If the work on Contract No. 14 had been vigorously pushed from its inception, access to Contract No. 13 from the west end would have been made possible a year earlier than it actually took place.

We do not feel, however, that one contractor is in a position to blame another for slow progress made on his own work, as, when the contracts were awarded, no conditions were inserted as to the method of reaching the work under contract, but the contractor undertook to complete a certain mileage of railway by a certain date and the responsibility in this matter cannot be shouldered off on other contractors who have undertaken similar contracts and signed similar agreements. In this case, we feel that Messrs. Macdonell & O'Brien might justly be penalized to the extent of seventy thousand dollars, being represented by the fourteen months' initial delay at five thousand dollars per month, as by the expenditure of this amount in the construction of tote roads and other means of forwarding supplies to the site of operations at the date they were awarded the contracts would, in all probability, have reduced the delay in the completion of this work to the extent of fourteen months.

The contractors were given a higher price because of the inaccessibility of the work and had no valid reason for delaying operations.

The Commissioners should have cancelled the contract for default and relet the work when it became accessible.

Contract No. 14.

From about 8 miles west of Abitibi Crossing, easterly for 150 miles.
Chief Engineer's estimate of cost, $3,985,462.40.
Tenders advertised for January 5, 1907.
Tenders received February 14, 1907.

SUMMARY OF TENDERS.

		Difference between tenders.
Tender No. 2, Grand Trunk Pacific Railway.....	$3,986,901.42	
Tender No. 1, Pacific Construction Co. (E. F. Fauquier)	4,423,837.11	$436,935.69

Contract awarded to Grand Trunk Pacific Railway, March 14, 1907.
Date for completion, September 1, 1909.
Work commenced, September, 1907.
Security accompanying tender, $225,000 cash.
Additional security called for, nil.
Security returned to contractor, July, 1910.
$375,000 of 10 per cent drawback paid contractor, July, 1911.
Gross amount of progress estimate to December 31, 1911, $5,246,744.16.
Amount of drawback retained on December 31, 1911, $149,674.41.
Percentage of contract complete to December 31, 1911, 69.75 per cent.

The completion of this 150 miles of railway from Cochrane, easterly, has a most important bearing on the final completion of the through line of railway from Winnipeg to Quebec. It was the gateway to the territory covered by Contract No. 13, and the slow progress made has proved a stumbling block to the early completion of this portion of the line.

The Grand Trunk Pacific Railway Company, in competition with the Pacific Construction Company, in which Mr. E. F. Fauquier was the chief factor, secured the contract.

The Grand Trunk Pacific Railway Company, under an agreement dated September 11, 1907, sublet to the J. H. Reynolds Construction Company, a firm incorporated under the laws of the State of Missouri, that portion of the contract extending easterly from a point fifty miles east of the junction of the Temiskaming and Northern Ontario Railway with the Transcontinental Railway to the end of the contract, this subcontract covering the easterly 100 miles of Contract No. 14.

A further agreement was entered into between the Grand Trunk Pacific Railway Company and the J. H. Reynolds Company on March 11, 1908, whereby the latter firm took over from the Railway Company the construction of the westerly fifty miles of Contract No. 14 under the same terms, conditions and prices as embodied in the agreement of September 11, 1907, so that when the second agreement was signed, the entire one hundred and fifty miles of Contract No. 14 was sublet to the J. H. Reynolds Company.

The J. H. Reynolds Company, however, failed to perform and carry out the construction work covered by these two contracts, and the agreements were, by mutual consent, put an end to and determined on February 9, 1909, at which date the Grand Trunk Pacific Railway Company entered into a new agreement with Messrs. Foley, Welsh & Stewart, covering the entire one hundred and fifty miles under the terms of which the Railway Company undertook to provide the requisite funds for the carrying on of the work, while Messrs. Foley, Welsh & Stewart were to act in the capacity of superintendents and to give the benefit of their organizations to the enterprise.

Agreement provided that the Grand Trunk Pacific Railway Company pay to their agents, Messrs. Foley, Welsh & Stewart, five per cent of the total value of the work as shown by the progress estimates, certified to by the Chief Engineer.

The grading work on this contract was largely handled by gangs of stationmen, the excavation being composed of clay and sand of various consistencies.

The average prices paid the stationmen were:

Solid rock	$1.40 per cubic yard
Loose rock	.40 " " "
Common excavation	.25 " " "

For which the Grand Trunk Pacific Railway Company received:

Solid rock	$1.75 per cubic yard
Loose rock	.65 " " "
Common excavation	.35 " " "

No statement has been prepared showing the profits realized by the Grand Trunk Pacific Railway Company on this work, but, on the assumption that they, in this case, as in their other contracts, would realize about five per cent in profits on the total returns up to December 31, 1912, this profit to the Railway Company would amount to about $300,000.00.

As will be noted, the contract was awarded in March, 1907, and one hundred miles of this work was sublet to the Reynolds Construction Company in September of that year, which was an initial delay of five months in the commencement of operations.

The balance of the contract, comprising the westerly fifty miles, was sublet to the same firm in March, 1908, and in February, 1909, these agreements were put an end to, and Messrs. Foley, Welsh & Stewart took over the work.

The monthly returns under this contract show that from September, 1907, up to March, 1908, less than twenty thousand dollars' worth of work was performed by the J. H. Reynolds Company, and subsequently the value of the biggest month's work which they carried out was forty-eight thousand dollars.

We do not know what assurances the Reynolds Company gave the Grand Trunk Pacific Railway Company with respect to their capability and financial standing, but we consider that the slow progress of the work as indicated by the first six months' returns should have led them to consider the matter very thoroughly before subletting the balance of this contract to the same firm.

The J. H. Reynolds Construction Company practically abandoned operations in January, 1909, as only fifteen hundred dollars' worth of work was done during that month. Messrs. Foley, Welsh & Stewart, the acting managers for the Grand Trunk Pacific Railway Company, took over the entire one hundred and fifty mile contract the next month.

This contract runs through the Northern Ontario clay belt, a large percentage of which clay has been returned under the heading of loose rock.

The engineer's estimate for this work contained 6,689 cubic yards of loose rock, while the returns to December 31, 1911, were 1,137,333 cubic yards of loose rock.

It was on this work that Mr. A. T. Tomlinson occupied the dual position as Inspecting Engineer for the Grand Trunk Pacific Railway Company, and Superintendent for Messrs. Foley, Welsh & Stewart, the contractors.

CONTRACT NO. 15.

From about 8 miles west of Abitibi Crossing, westerly 100 miles, being from Mile 1028.80 to 1128.77. 99.77 miles.

Chief Engineer's estimate of cost, $4,124,233.30.

Tenders advertised for February 1, 1908.

Tenders received March 10, 1908.

SUMMARY OF TENDERS.

		Difference between tenders.
Tender No. 2, E. F. & G. E. Fauquier	$3,936,536.00	
" No. 1, Grand Trunk Pacific	4,334,214.00	$397,648.00

Contract awarded to E. F. & G. E. Fauquier, March 28, 1908.
Date for completion, September 1, 1910.
Work commenced, May, 1908.
Security accompanying tender, $150,000 cash.
Additional security called for, nil.
Security returned, June 10, 1910.
$200,000 of 10 per cent drawback paid contractor January, 1911.
$90,000 of 10 per cent drawbaek paid contractor July, 1911.
Gross amount of progress estimate to December 31, 1911, $4,108,908.10.
Amount of drawback retained on December 31, 1911, $120,890.81.
Percentage of contract complete to December 31, 1911, 87.85 per cent.

A large portion of the grading and concrete work on this contract was sublet, and the following figures show a comparison between the main contractors' rates and the average rates paid subcontractors for various items:

	Main contractors. Price per cubic yard.	Subcontractors. Average price.
Solid rock	$1.85	$1.57
Loose rock	.70	.52
Common excavation	.40	.31
Concrete, 1-3-5	15.00	11.00
Concrete, 1-3-5 in arch culverts	16.00	11.50
Concrete, 1-3-6 in arch culverts	15.50	11.25

CONTRACTS NOS. 16 AND 17.

Contract No. 16.

From the west end of Fauquier's Abitibi contract, westerly for about 104.34 miles.

Chief Engineer's estimate of cost, $3,224,718.75.
Tenders advertised for September 12, 1908.
Tenders received September 28, 1908.

SUMMARY OF TENDERS.

		Difference between tenders.
Tender No. 1, M. P. & J. T. Davis	$3,308,048.25	
" No. 2, Grand Trunk Pacific	3,402,584.50	$94,536.25

Contract awarded to M. P. & J. T. Davis, October 29, 1908.
Contract assigned, September 29, 1909, to O'Brien, O'Gorman & McDougall.
Work commenced January, 1910.
Date for completion, December 31, 1910.
Security accompanying tender, $150,000 cash.
Additional security called for, nil.
$50,000 of 10 per cent. drawback paid contractor, January, 1911.
$50,000 of 10 per cent drawback paid contractor, June, 1911.
Gross amount of progress estimate to December 31, 1911, $2,500,695.78.
Amount of drawback retained on December 31, 1911, $150,069.58.
Percentage of contract complete to December 31, 1911, 47.83 per cent.

Contract No. 17.

From Mile 1232.85 to 1332.85. 100 miles.
Chief Engineer's estimate of cost, $2,004,330.63.
Tenders advertised for September 12, 1908.
Tenders received September 28, 1908.

SUMMARY OF TENDERS.

		Difference between tenders.
Tender No. 1, M. P. & J. T. Davis	$2,019,908.25	
" No. 2, Grand Trunk Pacific Railway	2,016,246.00	$36,337.75

Contract awarded to M. P. & J. T. Davis, October 29, 1908.
Contract assigned, September 29, 1909, to O'Brien, O'Gorman & McDougall.
Date for completion, March, 1911.
Security accompanying tender, $150,000 cash.
Additional security called for, nil.
Gross amount of progress estimate to December 31, 1911, $1,110,914.78.
Amount of drawback retained on December 31, 1911, $111,091.47.
Percentage of contract complete to December 31, 1911, 29.52 per cent.

These two contracts which cover a little over 200 miles of grading, are located due north of Lake Superior, and were, at the time the contract was awarded, in the most inaccessible portion of the country traversed by the National Transcontinental Railway. Both contracts were awarded to Messrs. M. P. & J. T. Davis, on October 29th, 1908, and according to the terms of each contract, they were to be completed on December 31st, 1910.

Work was commenced on Contract No. 16 in January, 1910, or 15 months after the awarding of the contract, and on December 31, 1910, which is the date the work was to have been completed, twelve and a half per cent of the work had been done.

Work was not even commenced on Contract No. 17 until March, 1911, or two years and five months after the contract had been awarded, and three months after the date set for its completion. On September 29, 1909, 11 months after the work had been let to Messrs. Davis, they assigned their interest under these two contracts to M. J. O'Brien, J. O'Gorman and Alexander McDougall, trading under the firm name of O'Brien, O'Gorman & McDougall, for the construction of this work, for the consideration and upon the conditions set forth in a deed of transfer passed between these parties on September 16, 1909, under the terms of which Messrs. O'Brien, O'Gorman & McDougall were to pay to Messrs. M. P. & J. T. Davis 10 per cent of the total estimates returned on these works.

This assignment was submitted to and approved by the Commissioners, so that Messrs. O'Brien, O'Gorman & McDougall became the main contractors and payments for work done are made direct to them.

The prices paid for work done under these contracts are very greatly in excess of the average price paid for similar work on other portions of the railway, and the following list shows a number of the rates which were paid on these contracts, together with the average price paid for these items on all other contracts:

Item.		Prices paid.	Average price on other contracts.
1.	Clearing	$60.00	$ 50.00
3.	Grubbing	175.00	145.00
4.	Solid rock	1.90	1.60
5	Loose rock	.85	.60
6.	Common excavation	.43	.29
7.	Ex. in foundations	1.50	.97
8.	Ex. in cofferdams	5.00	3.12
10.	Piles delivered	.40	.28½
13.	Sheet piling, Wakefield type	100.00	74.00
12.	Sheet piling	80.00	57.00
15.	Pole drains	.75	.52
16.	French stone drains	2.00	1.52
17.	Paving in culverts	7.00	4.01
18.	Crib filling	4.00	2.24
19.	Riprap, hand laid	5.50	2.98
20.	Riprap, random	4.00	1.90
22.	Round logs in cribs	.40	.26½
23.	Cedar mudsills per M	50.00	40.50
24.	Framed trestles per M	90.00	52.00
25.	Caps, etc., per M	90.00	51.40
26.	Ties and guard rails per M	90.00	50.77

District A, Rock Borrow from side of Cutting. Page 26.

District B, Residency 37, Mileage 29.4. Assembled Rock. Page 68.

27.	Stringers per M.	90.00	62.00
28.	Cedar in culverts	50.00	43.50
29.	Plank in crossings	45.00	32.50
30.	Timber in culverts	50.00	43.50
30a.	Timber in cofferdams	60.00	44.00
30b.	Timber in caissons	100.00	66.43
58.	Concrete in 1-2	30.00	16.40
59.	" 1-2-4	18.00	14.00
60.	" 1-3-5	17.50	13.00
61.	" 1-3-6	16.00	12.00
61a.	" 1-2-5	18.00	14.60
62.	" 1-3-5 in arch culverts	17.50	13.00
63.	" 1-3-6 in arch culverts	16.00	12.42
64.	" 1-3-6 in box culverts	16.00	11.50
65.	" 1-4-8	14.00	10.75
66.	" 1-4-8 in walls of buildings	16.00	11.68
67.	Masonry, first class	25.00	17.00
68.	Masonry, second class	18.00	13.50
69.	Masonry, third class	16.00	10.30
70.	Masonry, dry	10.00	7.00
71.	Masonry, in arch rings	30.00	23.40
76.	Ties, first class	.70	.51
77.	Ties, second class	.65	.46
78.	Switch ties, per M.	70.00	45.00

Because the contractors had done nothing towards the performance of their contract, on August 2, 1909, Mr. Hays, President of the Grand Trunk Pacific, wrote to the Prime Minister urging the cancellation of the contracts, and because it gives succinctly good reasons why it should have been acted on, we reproduce it here:

"My dear Sir Wilfrid:

"On the 29th day of October, 1908, the National Transcontinental Railway Commissioners awarded two contracts for the construction of about 204 miles on Sections "D" and "E" of the National Transcontinental Railway. The first section starting on the west end of Fauquier Brothers' Abitibi contract, in the Province of Ontario, about 100 miles west of Cochrane, for a distance of 104.24 miles; the second contract commencing at the termination of the first and joining Fauquier Brothers' contract north of Lake Nipigon, a distance of 100 miles. By the terms of these contracts the work was to commence immediately after the execution of the agreements to be proceeded with continuously and diligently under the personal supervision of the contractor until completed, the date of completion being 31st December, 1910.

"This work is remote from rail transportation, the closest point being 100 miles west of Cochrane. The prices at which the work was awarded were very high and consequently sufficient to allow contractors to build tote roads or some other means of transportation and getting in supplies so as to immediately commence work. To the best of our knowledge no attempt has been made as yet to open this work, and the indications are that while the work, as before stated, was let at very high prices on account of the difficulties of transportation, it is now the intention of the contractors to haul their material over a portion of the Fauquier Brothers' work track, on which will be completed the present season, say about 50 miles, and haul along right of way to their own section 50 miles distant. This delay will add largely to the profits of the contracts with no commensurate advantage so far as the National Transcontinental Railway is concerned, and under the circumstances I will ask that the Government arrange for the cancellation of existing contracts and ask for new bids which can undoubtedly be obtained

on very much reduced schedule prices,—particularly so if it is known that the contractors will be enabled to haul their material and supplies over such portion of Fauquier Brothers' work as track has been laid upon.

"Yours very truly,
"CHAS. M. HAYS."

Mr. Hays also sent a copy of this letter at a later date to Mr. Parent, asking for the cancellation of the contracts, and that new tenders be called for this work. Mr. Parent refused to take any action, and we do not find that any pressure was brought to bear on the contractors to take steps to ensure the early completion of these two contracts.

The basis of the argument of the Grand Trunk Pacific Railway, for the cancellation of these contracts, is thus expressed, in a letter from Mr. Hays to Mr. Parent, dated October 9, 1909:

"The point I make is that these tenders, those made by the Grand Trunk Pacific itself as well as those made by other contractors, were all based on the work having to be taken up at once and completed within a certain time, thereby making necessary the taking in of supplies overland at a great expense. Several months have been allowed to pass without anything having been done by the contractors. In the meantime, the work immediately adjoining the sections under discussion has been completed to an extent that will permit the bringing in of supplies at a very much lower price, meaning thereby, a much greater profit to the contractor in the sections named than if he had commenced work as was assumed he would be required to do when the contracts were let.

"What we are asking now is that since we are to pay the interest on the cost of this work, and the contractors having not been pushed, that new tenders should be asked and if this is done the work could be let for much more reasonable rates than was the case in the first place, at a saving to the Government and eventually to the Grand Trunk Pacific, which is to pay rental based on the cost."

The position taken by Mr. Hays is absolutely unanswerable. The Commissioner had the right under Section 21 of the contract to take it out of the hands of the contractors. Knowing that Mr. Parent is a lawyer of eminence, we are surprised that he should have written such a reply to Mr. Hays as the following:

14th October, 1909.

"Dear Mr. Hays:

"The essential point in your letter of August 2nd to the Honorable the Premier, regarding certain contracts in districts 'D' and 'E' was a request that they should be cancelled. In my answer, I therefore endeavored to show that, the award having been quite regular in every respect—which you admit—such a step as was suggested would be illegal on the face of it.

"I noticed your contention that the prices were too high, but did not think necessary, for the reason just given, to dwell at very great length on that side of the question. Even granting the propriety of the ground taken, there is little doubt that it would not be sufficient before law to render void actions which were regularly performed.

"For the purpose of discussion, however, I am willing to go into particulars.

"Among other proofs that your company had urged with us that the work referred to should be let at an early date, I shall quote from a letter written by Mr. Morse to the Honorable the Minister of Railways, on May 12th, 1908, which says:

"In order to give the Grand Trunk Pacific an outlet to the east through Northern Ontario, the contracts for the inlet portions of the line between Lake Superior Junction and the T. & N. O. Railway to be let without further delay, it being understood that the surveys are sufficient advanced to permit this being done.

"We complied with these wishes and contracts were signed on the 26th December of the same year. At such a late date in the season the contractors were unable to get their supplies, materials and plant in soon enough to begin operations during the next season.

"Our forms of contract provide, it is true, that work be started at once and pursued diligently until completion, which, in the present case, is to take place on or before December 31st, 1910. Allowance must be made, as you know, for adverse conditions. I need only to point out the fact that we have done so for more than one of your sub-contractors, viz: the J. H. Reynolds Construction Company, who were so much behind in their work and gave us endless trouble. They were unable to carry out the undertaking, and we had at one time to advance money to pay their men. Yet your company would not withdraw its contracts, although they were practically in default. There is surely much less cause and possibility to do so in the present instance, where the facts are altogether different.

"Now we come to your statement, that tenders were all based on the work having to be taken up at once and completed within a certain time. As supplies had to be taken overland at great expense, the prices would naturally be high. Perhaps the work done on the adjoining section may, but the difference would not be as large as you claim. There will be still a considerable distance to cover by 'tote' roads, while haulage by rail through to the point of delivery is no small item, and this remains the same. Labour conditions, which you represented as favorable at the time, must have been taken in account by the tenderers. It is not likely that workingmen can be had to-day as cheaply as could be expected a year ago, during the financial stringency.

"There is no certainty, therefore, that better prices than before could be obtained now if new tenders were to be called for. Any advantage that might be gained on one hand would be more than counterbalanced by the loss of time on the other, not to mention the liability incurred. It would take a year or more before another contractor would get down to work.

"We are told that preparations have been made to proceed actively with the work, and it can be expected that these two sections will be ready in good time.

"In any event, there would be no way of complying with your suggestion, as stated before, unless the contractors would give their consent to the work being let anew, which, it seems, would be a most unusual course in business.

"Yours very truly,
"S. N. PARENT,
"*Chairman.*"

This letter does not contain one reason, which justified the Commission in its refusal. The contractors were clearly at that time a whole year in default and could have no legal or moral claim to any consideration from the Commission.

The total amount of money in Contracts Nos. 16 and 17 paid for work done to the end of October, 1913, amounts to more than $7,400,000, and, as already pointed out, the agreement by which Messrs. M. P. & J. T. Davis transferred these contracts to Messrs. O'Brien, O'Gorman & McDougall, provided for them a profit of 10 per cent of this sum, so that Messrs. M. P. & J. T. Davis have received a bonus from the country of over $740,000 for which they gave no return.

This Commission finds that no action was taken to enforce the early commencement work on these two contracts, nor, when the assignment of these contracts was brought to the Commissioners for their approval eleven months after the contracts had been awarded, were any steps taken to annul the gift of $740,000 to Messrs. M. P. & J. T. Davis.

To sum up, if the work had been immediately proceeded with, the high prices paid for the work under these contracts, would have been justifiable to some extent on account of the isolation of the section. The contractors, however, were permitted to hold the contract until it was salable at an enormous profit, when the site became easily accessible by the construction of the road to its east and west limits.

The Commissioner's refusal to cancel the contracts and relet the work, under the circumstances related, was absolutely inexcusable.

CONTRACT No. 18.

From about 19 1-2 miles west of Crossing of Mud River, easterly 75 miles, being from Mile 1332.85 to 1407.85.

Chief Engineer's estimate of cost, $2,326,333.33.

Tenders advertised for February 1, 1908.

Tenders received March 10, 1908.

SUMMARY OF TENDERS.

		Difference between tenders.
Tender No. 3, E. F. & G. E. Fauquier	$2,101,499.88	
" No. 2, Chambers Bros. & McQuigge	2,192,509.15	$ 91,009.27
" No. 1, J. D. McArthur	2,325,777.50	133,268.35
" No. 4, Grand Trunk Pacific Co.	2,565,186.10	239,408.30
Difference between highest and lowest tenders		$463,686.22

Contract awarded to E. F. & G. E. Fauquier on March 28, 1908.
Date for completion, September 1, 1910.
Work commenced, July, 1908.
Security accompanying tender, $100,000 cash.
Additional security called for, nil.
Security returned to contractor, June 10, 1910.
$75,000 of 10 per cent drawback paid contractor, January, 1911.
$75,000 of 10 per cent drawback paid contractor, July, 1911.
Gross amount of progress estimate to December 31, 1911, $1,915,855.09.
Amount of drawback retained on December 31, 1911, $41,585.51.
Percentage of contract complete to December 31, 1911, 66.03 per cent.

This contract covers 75 miles of railway construction on District "E," lying immediately north of Lake Nipigon. In accordance with the usual custom, the engineers compiled an estimate of the approximate quantities of grading and work to be done on this 75 miles of construction. This estimate was made so as to be able to arrive at the comparative values of the tenders when received, the various items being moneyed out at the tenderers' prices as previously

explained. In the approximate estimate prepared by the engineers there is shown under Item 74 (e) an estimated quantity of 655,400 cubic yards of moss to be removed. This yardage of moss is half as much as the entire quantities allowed for excavation in the approximate estimate, which are as follows:

Item 4.	Solid rock	225,845	cubic yards
" 5.	Loose rock and other materials.....	25,900	" "
" 6.	Common excavation	1,046,000	" "
		1,297,745	" "

This yardage of moss in the approximate estimate was entirely out of proportion to the actual amount encountered on the work, as to date there has only been returned about 14,000 cubic yards. The 655,400 cubic yards of moss would provide a carpet of this material 20 feet wide and more than two feet thick over the entire 75 miles. This approximate estimate was prepared in the District Engineer's office at Nipigon under the supervision of District Engineer Armstrong, and in a letter to Mr. Gordon Grant, under date of October 14, 1913, District Engineer Armstrong explains the inclusion of the large quantity of moss, as follows:

"With regard to moss, this is the one item in the schedule that was not "seriously considered. It was never mentioned in returns of quantities by the "locating engineers and personally I knew nothing of what quantity there might "be, but in my travels to the locating parties I knew that in some cases in the "woods it was a couple of feet thick, and as this item was in the schedule, Form '89, I took the profile and on level swampy ground simply added enough moss "to cover, in case it might have to be removed."

Four contractors tendered on this work and the following statement shows a comparison of the prices for the main items in the engineers' estimate of the work to be done under this contract:

Tenderer.	Tenderers' price per cubic yard. Solid rock.	Loose rock.	Common excavation.	Moss.
E. F. & G. E. Fauquier.....	$1.80	.60	.38	.12
Chambers Bros. & McQuigge....	1.75	.65	.31	.35
J. D. McArthur	1.80	.65	.38	.35
G. T. P. Railway Co.....	1.85	.70	.45	.32

It will be noted from these figures that Messrs. Fauquier Brothers' price for the removal of moss was very much lower than that of the other three tenderers. The tenders were moneyed out in accordance with the estimate prepared and Messrs. Fauquier Brothers' tender was found to be about $91,000 less than the next lowest bid, which was that of Messrs. Chambers Brothers & McQuigge, and the contract was awarded accordingly.

If the price tendered by Messrs. Chambers & McQuigge for the removal of moss had been 12 cents instead of 35 cents, their tender would have been lower than Messrs. Fauquier Brothers by $58,000. The Commission have had the total quantities returned on this contract up to October 31, 1912, moneyed out at Messrs. Fauquier Brothers' prices and also at the prices contained in the tender put in by Messrs. Chambers Brothers & McQuigge, and they find that if the contract had been awarded to this latter firm there would have been a saving effected of about $33,000. This is on account of the fact that the prices contained in Messrs. Chambers Brothers' tender are generally lower than those contained in Messrs. Fauquier Brothers' tender. The large yardage of moss contained in the engineers' estimate was the governing factor in the valuation of the tenders received for the 75 miles of railway construction.

Mr. E. F. Fauquier, in his evidence on page 491 states that he knew that a large amount of moss was being estimated upon this work, that he obtained information from some of the junior engineers, and that he expected that his tender would have a very favorable showing on account of the price he estimated for the removal of moss per cubic yard.

Mr. E. F. Fauquier in giving evidence stated that he appreciated that the Engineering Department was under the impression that there was a very large quantity of moss to be removed on this contract and he expected that their estimates would show a large quantity of moss, while his information was that there was in reality a very small quantity, and he expected that if his rivals put in a high price for the removal of moss as he was putting in a lower price, he would probably get the contract, and in this he was right.

His tender was $150,000 less for moss than that of Chambers Brothers & McQuigge. Had the moss been estimated even approximately correctly, Fauquier Brothers would not have been awarded the contract. The result is that they have the contract although they were not the lowest tenderer for the work really to be done.

This contract, Number 18, was completed and dated March 28, 1908. On April 6, 1908, one week after the signing of the contract, Fauquier Brothers sublet it to Messrs. Chambers Brothers, McCaffery & McQuigge, who were doing business under the name of the Nipigon Construction Company. Under the terms of this assignment Messrs. Fauquier Brothers were to receive four per cent of the total amount of the final estimate returned under this contract and were indemnified by the assignee against the security which they had furnished the Government. The result is, that the people who were really the lowest tenderers had to pay a premium to Fauquier Brothers to obtain the contract, which, had the moss estimate been correct, they would have been awarded by the Commission and the Commission on account of this error had to pay a larger price for the work actually done.

As to whether or not these tenderers were given advance information (see article on Awarding Contracts, p. 22), Mr. E. F. Fauquier was examined and the following is taken from his evidence:

Q. Do you know that if the engineers had not made an absurd mistake, as to the quantity of moss in that country, that your tender would not have been the lowest?—A. I have been told so.

Q. Moss is easily removed?—A. Yes.

Q. Yet the engineers estimated that there were 655,000 cubic yards of moss in there; was there any such quantity?—A. I do not know that we were allowed anything for more.

Q. You were allowed 13,000 yards?—A. Yes.

Q. And that was about all the moss that was on the right of way?—A. I think so.

Q. Your price on that contract was 12 cents for moss? Do you remember that?—A. I think it was about twelve cents. On looking at the tender I find it was 12 cents.

Q. And Chambers tendered at 35 cents for moss?—A. Yes, it was an absurd price. Chambers told me he tendered at somewhere about that, and that is all I know about it.

Q. Your tender was $1.80 for solid rock there?—A. Yes.

Q. And for loose rock, 60 cents?—A. Yes.

Q. And for common excavation, 38 cents?—A. Yes.

Q. And Chambers tendered for $1.75 solid rock, 65 cents for loose rock, and 31 cents for common excavation?—A. I do not know as to that.

Q. And if it had not been for the moss, he would have got the contract?—A. Possibly.

Q. Do you mean to say it is impossible for you to tell us?—A. It is impossible for me to trace back how I got it. I got it from some of the junior engineers, I was enquiring about the whole contract from one and another, and I got the information.

Q. I want you to make your position as clear as you can.—A. I had the advantage of that knowledge; I do not mind acknowledging it; I do not want to husband it up in any way.

Q. And the fact that you tendered 12 cents on moss. . . .—A. I would have tendered that anyway.

Q. At all events, it gave you the contract?—A. Yes, but I should have tendered about twelve cents on moss, whether I knew it or not. You know yourself that it is easy to remove moss.

Q. But you did have knowledge that there was going to be a large amount of moss figured on that contract, and you rather expected it?—A. Yes.

Q. And you knew when your bid was going in that your moss bid was going to get you the contract?—A. I expected it would be very favorable.

CONTRACT No. 19.

From the westerly end of Fauquier's contract, westerly 126.19 miles, being from through mileage 1407.85 to 1554.04.

Chief Engineer's estimate of cost, $7,864,791.23.

Tenders advertised for July 1, 1908.

Tenders received August 20, 1908.

SUMMARY OF TENDERS.

		Difference between tenders.
Tender No. 2, O'Brien & Fowler	$5,967,208.75	
" No. 3, Nipigon Construction Co.	6,403,536.50	$436,327.75
" No. 1, J. W. Stewart	6,450,334.50	46,798.00
" No. 4, Craig & Thomson	6,553,761.25	103,426.75
Difference between highest and lowest tenders		$586,552.50

Contract awarded to O'Brien, Fowler & McDougall, September 19, 1908.
Date for completion, September 1, 1910.
Work commenced, November, 1908.
Security accompanying tender, $200,000 cash.
Additional security called for, nil.
Security returned to contractor, June 1, 1910.
$260,000 of 10 per cent drawback paid contractor, January, 1911.
$80,000 of 10 per cent drawback paid contractor, July, 1911.
Gross amount of progress estimate to December 31, 1911, $4,812,513.27.
Amount of drawback retained on December 31, 1911, $141,251.32.
Percentage of contract complete to December 31, 1911, 79.25 per cent.

CONTRACT No. 20.

(and No. 20-A.)

From near Dog Lake westerly about 24.13 miles, being from Mile 1534.04 to 1557.80.

Chief Engineer's estimate of cost, $1,513,247.00.
Tenders advertised for July 18, 1908.
Tenders received August 20, 1908.

SUMMARY OF TENDERS.

		Difference between tenders.
Tender No. 2, O'Brien & McDougall	$1,158,258.25	
" No. 1, J. W. Stewart	1,284,979.50	$126,721.25

Contract awarded to O'Brien & McDougall, September 19, 1908.
Date for completion, September 1, 1909.
Work commenced, October, 1908
Security accompanying tender, $100,000.
Additional security called for, nil.
Security returned to contractor, June 1, 1910.
$120,000 drawback paid contractor, July, 1911.
Gross amount of progress estimate to December 31, 1911, $2,000,437.56.
Amount of drawback retained on December 31, 1911, $47,257.20.
Percentage of contract complete to December 31, 1911, 96.69 per cent.

The eastern eleven and one-half (11 1-2) miles of Contract No. 20 is known as Contract No. 20-A, though the work on this portion is included in Contract No. 20, and the work was performed by Messrs. O'Brien & McDougall, and the payment for the work is made to them. It is designated as Contract No. 20-A for the reason that it originally constituted a portion of the branch line constructed by the Grand Trunk Pacific Railway Company from Fort William to join the main line of the National Transcontinental Railway.

These eleven and a half miles of railway were partially completed when the Commission were about to let contracts for Contract No. 20. It was then found that if the line surveyed and located by the Government were adopted and constructed, they would be paralleling the Grand Trunk Pacific branch line for a distance of about 11 1-2 miles. The line adopted by the Government was known as the northerly route, and the line partially constructed by the Grand Trunk Pacific Railway was known as the southerly route, and the Commissioners, in considering this matter, had the following situation before them:

They were bound to pay for the construction of these 11 1-2 miles of railway. If they adopted the northerly route and built the railway on that line, when completed the Grand Trunk Pacific Railway Company would have to operate two lines of railway, paralleling each other, over a distance of 11 1-2 miles. If the southerly route were chosen, only one line of railway need be constructed and operated.

The Commissioners decided upon the adoption of the southerly route, and took over from the Grand Trunk Pacific Railway Company the 11 1-2 miles of their partially constructed branch line and converted it into the main line of the National Transcontinental Railway. It was to the advantage of the Grand Trunk Pacific Railway that the southerly route was decided upon, for they were thereby saved the construction of 11 1-2 miles of branch line at about $50,000 per mile, or, in round figures, the sum of $575,000.

Mr. Frank W. Morse realized this advantage and wrote many letters to the Commission, urging the adoption of the southerly line, and in one dated July 2, 1911, he says:

> "Lengthening the main line one mile east of the Lake Superior connection only affects a small number of trains and hence a small percentage in operating and maintenance expenses, as compared with shortening the Lake Superior branch 11½ miles with its greater number of trains."

The objection to the adoption of the southerly line as the main line of the National Transcontinental Railway, was that it would increase the length of their main line approximately a third of a mile, and their cost of construction approximately $197,000. Mr. Lumsden's report on this matter is as follows:

"Ottawa, September 11th, 1908.

"The Commissioners of the
Transcontinental Railway,
Ottawa, Ont.

"Sirs:—

"In reference to mine of the 25th August handing in details of comparison of tenders, I beg to supplement the same by adding to the report in regard to Section No. 6, that in my opinion the southerly route, though approximately one-third of a mile longer, and costing—taking into consideration divisional yard—approximately $197,000 more than the northerly route, should be adopted for the following reasons, viz:

"1. It will avoid the duplication of the construction of about 11½ miles of road.

"2. It will afford better accommodation for divisional yards.

"3. It will save the operation of 11½ miles for all time, which advantage will accrue to the Government in the event of the taking over of the branch line at any time in the future.

"4. The interest on the additional cost will, under the terms of the lease of the Eastern Division, be borne by the G. T. P.

"Your obedient servant,

"HUGH D. LUMSDEN,
"*Chief Engineer.*"

The points about this case are as follows:

The main line of the Transcontinental Railway was increased in length and in cost by $197,000 (estimated). The branch line of the Grand Trunk Pacific was reduced in length by 11 1-2 miles (estimated cost $575,000).

We find that the extra expenditure made on this account by the Government should have been properly charged to the Grand Trunk Pacific Railway Company and an agreement should have been entered into between the two parties, providing for the restitution of this amount of capital to the Government.

CONTRACT No. 21.

From or near Winnipeg to Peninsula Crossing, about 245 miles, being from mile 1557.80 to 1804.47. 246.67 miles, Dist. "F."

Chief Engineer's estimate of cost, $13,756,023.54.

Tenders advertised for, February 8, 1906.

Tenders received, March 12, 1906.

SUMMARY OF TENDERS.

		Difference between tenders.
Tender No. 4, J. D. McArthur	$13,010,399.00	
" No. 2, Pacific Construction Co. (Fauquier)	13,028,753.00	$18,354.00
" No. 3, G. T. P. Railway Co.	13,991,860.00	963,107.00
" No. 1, The McArthur Construction Company	17,048,813.00	3,056,953.00
Difference between the highest and lowest tenders		$4,038,414.00

Contract awarded to J. D. McArthur, May 15, 1906.
Date for completion, September 1, 1907.
Security accompanying tender, $400,000.
Additional security required, $910,000.
$400,000 of drawback paid April 6, 1908.
$500,000 of drawback paid December 5, 1908.
$150,000 of drawback paid February 22, 1911.
Gross amount of progress estimate to December 31, 1911, $18,268,710.54.
Amount of drawback retained on December 31, 1911, $154,446.92.
Percentage of contract completed to December 31, 1911, 94.60 per cent.

The Commissioners could not agree upon the awarding of this contract, and the Chairman, in his minority report to the Minister of Railways and Canals, wrote as follows:

"As for District 'F,' as already stated, the two lowest tenders for this section are also several hundred thousand dollars below our engineer's estimate, but our engineers are of the opinion in that case that the difference between the lowest tenders and their estimates is not sufficient to prevent the proper completion of the work. For the same reasons as have already been given in regards to District 'B,' especially in order to prevent any possible delay in the performance of the contract, I sincerely believe that the only tenderer personally interested and in a position to complete this work within the stipulated time, viz.: the 1st of September, 1907, is the Grand Trunk Pacific Railway Company, inasmuch as they already have important work in progress on their Lake Superior branch, and would have exceptional facilities for the transport of material, supplies, etc. This section being ready for operation at an early date, the Government would thus be sooner enabled to draw a revenue therefrom, and it will, moreover, facilitate the construction of the Western Division."

Commissioners McIsaac, Reid and Young did not concur with opinions held by Mr. Parent, and recommended the acceptance of the lowest tender, namely that of J. D. McArthur, with the stipulation "that the security required under Section 17, Chapter 71, 1903, be fixed at ten per cent of the amount of the tender, or $1,301,039, besides the ten per cent retained under Section 34 of the contract."

The acceptance of McArthur's tender was approved of by order in Council on April 14th, 1906.

The security for the completion of his contract, asked of McArthur, was the amount recommended—$1,301,000.00—and the Commissioners returned to him the cheque which accompanied his tender, and accepted in lieu thereof deposit slips amounting to the above named sum which were to be cashed only in the event of the contract going by default.

There were conditions in connection with the moneying out of their tenders for this contract which were a divergence from the usual practice.

The form of tender contained one hundred and one items for which the contractor had to submit prices.

Mr. McArthur, in submitting his tender, filled in prices for only fifty-eight items, leaving forty-three spaces blank.

In the estimate prepared by the Chief Engineer of the cost of this grading contract, items covering sixty-four features of construction were involved, and

when it became necessary to money out the tenders received in order to arrive at their comparative values, it was found that there were fourteen items contained in this estimate for which McArthur had submitted no prices.

The original sheets for Tender No. 4 (J. D. McArthur's), which contain the tenderers' prices, and which are designated by the number of the tender only, and are those which were handed the Chief Engineer by the Commissioners for the purpose of moneying out the tenders, have filled in, in red ink on them, prices for forty of the items enumerated, and these sheets bear the following notation (see Exhibit No. 29):

"Note.—Red figures show prices made up by Chief Engineer, and for the items so marked no prices were quoted in Tender No. 4.".

The following is a list of the forty items for which the rates have been filled in in red ink:

Item.		Rate.
15.	Pole drains	.25
21.	Piling out reserved stone from rock cuttings	1.00
28.	Cedar timber in culverts	40.00
32.	Vitrified pipe culverts, 14"	1.25
33.	" " " 15"	1.35
35.	Reinforced concrete pipe, 12"	1.20
36.	" " " 14"	1.30
37.	" " " 16"	1.40
38.	" " " 18"	1.50
39.	" " " 20"	1.60
40.	" " " 24"	1.70
41.	" " " 30"	2.00
42.	" " " 36"	2.50
43.	" " " 42"	3.50
44.	" " " 48"	4.50
45.	" " " 54"	5.50
46.	" " " 60"	6.50
47.	4-inch tile drains	.05
48.	Cast iron pipe culverts, 16"	2.30
49.	" " " " 18"	3.00
50.	" " " " 20"	3.50
54.	" " " " 42"	6.80
55.	" " " " 48"	7.50
56.	" " " " 54"	8.00
57.	" " " " 60"	10.00
60.	Concrete, 1-3-5	12.00
62.	Concrete, 1-3-5 in arch culverts	13.00
64.	Concrete, 1-3-6 in box culverts	11.00
66	Concrete, 1-4-8, walls of buildings	10.00
81.	Semaphores at stations	550.00
82.	Interlocking appliances	6,000.00
83.	Each additional lever	200.00
86.	Tunnels rock section unlined	75.00
87.	Tunnels lined	85.00
88.	Tunnels concrete lining	15.00
89.	Masonry lining	15.00
90.	Drainage tunnels	25.00
93.	Turntables	3,000.00
94.	Track scales	1,000.00
95.	Tunnel shaft	5.00

Mr. Lumsden states that, to the best of his recollection, he filled these figures in himself, personally, that he called attention to the fact that one of these tenders had not any prices in for a number of items which they were bound to use a lot of, and that he was instructed to fill them in, and that as

these instructions emanated from the men who were letting the contract he did not feel nervous about fixing up a tender (which subsequently developed into the winning tender) in this way. He did not recollect discussing the matter with Mr. McArthur.

Mr. McArthur explains that when putting in his tender he figures that the items left blank would not amount to very much, and that when the contract was being awarded it was left to the Chief Engineer, and, though he does not recollect the conversation with Mr. Lumsden, he and Mr. Lumsden discussed the question together, but he cannot say whether at the time of this discussion Mr. Lumsden had already inserted his figures in the blank spaces in the McArthur tender or not.

The following list shows the engineers' prices which were used in the final moneying out of the McArthur tender, and also the engineers' estimated quantities of each item:

Item.		
15.	Pole drains, 4,900 lin. ft. at 25c	$1,225.00
21.	Piling out reserved stone, 850 cu. yds. at $1.00	850.00
38.	Reinforced concrete pipe, 18", 872 lin. ft. at $1.50	1,308.00
40.	Reinforced concrete pipe, 24", 396 lin. ft. at $1.70	670.20
60.	Concrete, 1-3-5 1,000 cu. yds. at $12.00	12,000.00
62.	Concrete, 1-3-5 in arch culverts, 2,651 cu. yds. at $13.00	34,463.00
64.	Concrete, 1-3-6, in box culverts, 212 cu. yds. at $11.00	2,332.00
66.	Concrete, 1-4-8, walls of buildings, 2,000 cu. yds at $10	20,000.00
81.	Semaphores and stations, 34 at $550	18,700.00
82.	Interlocking appliances, 1 at $6,000	6,000.00
83.	Each additional lever, 5 at $200	1,000.00
90.	Drainage tunnels, 250 lin. ft. at $25	6,250.00
93.	Turntables, 3 at $3,000	9,000.00
94.	Track scales, 2 at $1,000	2,000.00

In order to draw attention to the peculiar condition brought about by the insertion of these prices, we append here a list of the rates submitted for the other concrete items in the original tender, these were:

Item.		
58.	Concrete facing mixture	$15.00
59.	Concrete coping course	15.00
61.	Concrete, 1-3-6	15.00
63.	Concrete in arch culverts, 1-3-6	15.00
65.	Concrete in ordinary foundations, 1-4-8	13.00

from which it will be noted that the richer concrete, namely the 1-3-5 mixture, which requires a greater quantity of cement (the governing feature of cost) is $2.00, $3.00 and less per cubic yard than the 1-3-6 mixture.

Mr. McArthur had told this Commission that he intended that the prices which he submitted for the several concrete items should govern those items which he had left blank, and that he intended his tender to be for:

Item.								
60.	$15.00	per	cubic	yard,	instead	of	$12.00
62.	15.00	"	"	"	"	"	13.00
64.	15.00	"	"	"	"	"	11.00
66.	13.00	"	"	"	"	"	10.00

and, as will be noted from the foregoing figures, this would have made a difference in the total value of the tender of for

Item.		
60.	1,000 cu. yds. at $3.00	$3,000.00
62.	2,651 cu. yds. at $2.00	5,302.00
64.	212 cu. yds. at $4.00	848.00
66.	2,000 cu. yds. at $3.00	6,000.00
		$15,150.00

and increased McArthur's tender to $13,010,339.00 plus $15,150—$13,025,549.00.

The insertion of these forty items by the Chief Engineer, while affecting the value of the tender to the amount stated, did not change the order in which the tenders ranked. If McArthur's tender had been monied out at the prices which he intended to submit, his would still have been the lowest by $3,204.00.

These unbalanced prices, however, caused some considerable discussion in the carrying out of the work.

During Mr. Lumsden's regime as Chief Engineer it was evidently considered good business to pay Contractor McArthur for the 1-3-6 concrete mixture at fifteen dollars per cubic yard when he had a price in his schedule for 1-3-5 concrete (the better mixture) at twelve dollars per cubic yard.

We feel that Mr. Lumsden could not have taken any very firm stand in this matter on account of the fact that it was he (though acting under instructions) placed these prices in the tender and so finally caused their adoption.

A further perusal of the sheet containing the tenders as monied out shows a much more serious error in regards to the items for piling, and one which had the direct result of changing not only the values of the tenders but their order of ranking.

In tender No. 2, the rates submitted for Items 10, Piling Delivered, and 11, Piling Driven, are 20c. and 35c.

In tender No. 4 (McArthur's) these figures are 25c and 15c respectively—with the notation opposite the latter price "driving only."

Without taking into consideration that in Tender No. 2 the cost of the piles themselves were included in the 35c. rate, these items were extended as follows:

Item.	Tender No. 2.	Tender No. 4.	
10. Piling delivered, 282,555 lin. ft. at 20c	$56,511.00	at 25c,	$70,638.70
11. Piling driven, 258,860 lin. ft. at 35c	90,601.00	at 15c,	38,829.00
	$147,112.00		$109,467.70
Total cost of piling—Tender 2	$147,112.00		
Tender 4	109,467.75		
	$37,644.25		

thereby giving McArthur an advantage over his competitors by reducing the total value of his tender by $64,715.00, which is the value of the piles themselves at his rate of 25c., and which sum should have been included under Item No. 11 in order to make a true comparison as to the values of the tender.

Mr. Lumsden contends that all the tenderers intended their price for "piling driven" to be the cost of driving only.

These figures for the four tenders are:

Tender No. 1	65c	
" No. 2	35c	
" No. 3	24c	
" No. 4	15c	(driving only)

and they certainly do not represent that condition.

While Mr. MacPherson states that the tenders as moneyed out convey a doubtful meaning as to their value, Mr. Monsarrat is definite that to obtain a true comparison, the value of the piles themselves should have been added to Tender No. 4.

As will be noted from the foregoing figures it was a combination of peculiar circumstances which resulted in this $13,000,000.00 contract being awarded to Mr. McArthur.

Tender No. 2 amounted to	$13,028,753.25
" No. 4 (McArthur's) amounted to	13,010,398.92
	$18,354.43

leaving a balance in McArthur's favor of $18,354.43 and from this balance should be deducted for the prices for concrete which Mr. Lumsden filled in, and which Mr. McArthur intended should be $2.00, $3.00 and $4.00 per cubic yard higher, the sum of $15,154.00, and for the cost of the piling which was omitted from his tender when moneying out, the sum of $64,715.00 which leaves Tender No. 2 the lowest by $61,514.57, and to which tenderer the contract should have been awarded.

The rates for excavation submitted in Tender No. 2 are all lower than those at which McArthur was paid, and a computation based on the final quantities returned on Contract No. 21 shows that if the work had been awarded to the lowest tenderer at his rates, the amount paid out would have been over $200,000.00 less than what it has actually cost.

In his evidence before this Commission the following questions were put and answers given by J. D. McArthur:—

Q. Do I understand you to say that you did not see or get any information which gave you any knowledge of what the preliminary estimate of the engineers was as to the cost of the work?—A. No. I did not get it in figures more than it was approximately spoken of.

Q. By whom?—A. Well, by Major Hodgins.

Q. Do you know whether he had a copy of the preliminary estimates made in the office by the engineers?—A. No. I do not.

Q. He did not show you any?—A. No.

Q. Did any of the Commissioners show you any?—A. No, not by really showing it to me. They may have talked over it, but I do not recollect them showing me the figures.

Q. Did any of the Commissioners tell you approximately what the estimates of the engineers were?—A. I think probably they did, just the same as Major Hodgins did, and he was down here at the time.

Q. Who probably told you?—A. I guess probably Young told me and Reid.

Q. So that you had a more or less accurate idea of what the Commission expected this work would cost?—A. These figures were mentioned.

By reference to the article on awarding the contracts it will be seen that this was quite irregular and an advantage contractors generally were not given.

CLASSIFICATION OF EXCAVATION.

The item in the general classification which caused most of the trouble among the engineers themselves, between the engineers and the contractors and between the engineers and the Commissioners, was the clause governing classification.

It should be remembered that all contracts were let on the unit basis, whereby a certain price per cubic yard was to be paid for each of the various kinds of material to be removed.

It is the common practice in Canada and the United States to contract for the removal of material, ranged under different heads, at unit prices, so that all experienced Canadian engineers, contractors, sub-contractors and stationmen know just what they are undertaking when they enter on such work, under such contracts. It has always been considered a contractor's privilege to endeavor to obtain a higher classification for materials, upon any plausible pretext, and the fact that the different classes are so intermingled, and because cuts of practically the same material differ slightly from each other, contractors are never at a loss for reasons to support their arguments for better terms, and experienced engineers know that they will be constantly bombarded with demands, more or less sincere, to modify their classification in favor of the contractors.

The very nature of the case, then, required that railway construction engineers should be men of integrity and experience, as their position makes them, in fact, arbitrators between the contractors and the railways, and very large discretionary powers are necessarily given to them.

The following is a copy of the Grading Specification used in all contracts on this railway:

33. Grading will be commonly classified under the following heads: "Solid Rock Excavation"; "Loose Rock" and "Common Excavation."

34. *Solid Rock Excavation.*—Solid rock excavation will include all rock found in ledges or masses of more than one cubic yard, which, in the judgment of the engineer, may be best removed by blasting.

35. *Loose Rock.*—All large stones and boulders measuring more than one cubic foot and less than one cubic yard, and all loose rock, whether in situ or otherwise, that may be removed by hand, pick or bar, all cemented gravel, indurated clay and other materials, that cannot, in the judgment of the engineer, be ploughed with a 10-inch grading plough, behind a team of six good horses, properly handled, and without the necessity of blasting, although blasting may be occasionally resorted to, shall be classified as "loose rock."

36. *Common Excavation.*—Common excavation will include all earth, free gravel or other material of any character whatever not classified as solid or loose rock.

As might be expected when vast quantities of material had to be classified and more than sixty millions of dollars was involved, very many disputes arose over the interpretation of these specifications, adding another to the multitude of examples that nothing which man can express in words is not open to forced construction, differing from what he plainly intended. It appears to this Commission that to the impartial reader there is no difficulty in understanding the true meaning of these specifications.

Clause 34 clearly limits solid rock excavation to "rock," that is, no material which is not rock can be classified under this head. Secondly, That rock must be in boulders, ledges or fragments, each one of which measures more than one cubic yard.

So far, the engineer has no discretion to exercise, but the remainder o the clause: "which, in the judgment of the engineer may best be removed b blasting," makes it his duty, not to allow even the above-described rock a solid rock excavation, if he believes blasting is not reasonably required for it economical removal. Thus, if he were asked to class as "solid rock excavation" a quantity of disintegrated granite or soft slate, which could be removed b shovel as earth or sand, he would not be justified, notwithstanding the fact tha it was "rock," in classifying it under this heading.

Loose Rock: To simplify this rather involved paragraph, it may be para phrased as follows: Under this heading should be classified:

(a) All lose rock or stones which measure more than one cubic foot an less than one cubic yard;

(b) All loose rock which may be removed by hand, pick or bar;

(c) All cemented gravel, indurated clay and other material which cannot in the judgment of the engineer be ploughed (as described) without first being blasted. (The fact, however, that over a large body of material blasting may be occasionally used to make some small portion of it ploughable, shall no bring the whole mass within this class.)

36. *Common Excavation.*—Common excavation will include all earth, fre gravel or other material of any character whatever, not classified as solid or loos rock.

It it clear, therefore, that loose rock includes everything excepting solid roc larger than one cubic yard, which requires to be blasted for its removal, and tha common excavation includes everything which is not described in clauses 34 or 35.

As will be seen, hereafter, vast quantities of material which was not rock has been classified and paid for by the Commission as solid rock excavation, and as it was admitted in their evidence by some of the chief contractors who had had many years experience contracting for railroads, that they were allowed a solid rock, material which they had never known to be classified as such before under any other contract.

Shortly after the work commenced, Mr. Woods, Assistant Chief Engineer of the Grand Trunk Pacific, protested to the contractors, in a letter dated October 7, 1907, against the classification being allowed to O'Brien & Macdonell at La Tuque in the Province of Quebec. He said:

> "In nearly every case where the cutting was not entirely of ledge, the estimate given for solid rock is double or more than double what it should be. In fact the specifications have been entirely ignored and an excessive allowance made, not by reason of an error in judgment, but, as I understand it, by special instructions from the Assistant District Engineer."

He then gives illustrations. (See Exhibit No. 15.)

Following this letter, the Commissioners, their Chief Engineer, Mr. Woods, Mr. Armstrong and the contractors, Mr. M. J. O'Brien and Mr. M. P. Davis, met at La Tuque to discuss the question on the ground.

The Chief Engineer, Mr. Woods, and Mr. Armstrong contended that under the specification the material should be classified as loose rock (p. 390) while the contractors, and, according to the evidence of Mr. Lumsden, the Chairman and Mr. McIsaac agreed that it should be solid rock, taking the position that because in their judgment the material required blasting for its economical removal, it was solid rock under the specification. No agreement was arrived at, the contractors obtained under their representations of the facts opinions from several leading counsel, copies of which were sent to the Commission, which supported their contention as to the classification. What the contention of the contractors was was made clear by the evidence of Mr. M. J. O'Brien as taken before this Commission.

District B, Division A, Mileage 189.5. Assembled Rock. Page 64.

District B, Residency 23, Mileage 81.1. Assembled Rock. Page 68.

Mr. O'Brien, who is, perhaps, one of the most experienced and largest contractors in America, admitted, however, that he had never been paid for such material as solid rock by any other railway. (p. 537.)

He was asked:

> Q. What is your contention? What under these specifications were you entitled to have classified as 'solid rock'?—A. Where the cutting is either one thing or another, mixed up, and can best be removed by blasting, I don't care what it is, if that cut is a solid mass of indurated earth and we cannot take it out any other way economically except by blasting, we must resort to blasting, and we are properly entitled to that as solid rock excavation.

The Chairman of the Commission gave copies of these legal opinions (p. 390) obtained by the contractors, to the Chief Engineer, and suggested that he consult Mr. Collingwood Schreiber. Mr. Lumsden says that the fact that the Commission was against him, the engineers against him, the opinions against him, made him waiver in his judgment, and he consulted Mr. Schreiber, who made a diagram which introduced into the classification a sub-head called "Assembled Rock," consisting of "Rock in masses of over one cubic yard (Assembled Rock) which in the judgment of the engineer can best be removed by blasting" (p. 390. See Exhibit No. 16).

There is nothing in this diagram said of cementing material, but Mr. Schreiber, who made it, and Mr. Lumsden say what they meant to say was that these masses of rock should be cemented together to qualify as solid rock excavation and Mr. Doucet so told his engineers. This diagram and the lawyers' opinions were sent broadcast among the engineers, the first by the Commission, and the latter by the contractors, and resulted in our judgment in the utter demoralization of the classification. Why stones, which were less than a yard in size, which are by clause 35 declared to be loose rock, can be turned into solid rock excavation under any condition, passes our understanding.

The appended statement shows that material, which this Commission unhesitatingly finds should have been classified as loose rock or common excavation, to the extent of 2,828,000 cubic yards was classified as solid rock excavation under the heading of "assembled rock." It is well to remember that Mr. O'Brien admitted that under no other classification had he ever been allowed "assembled rock" as solid rock excavation, and Mr. McArthur says (p. 518):

> Q. From information before us, you appear to have been paid for 408,220 cubic yards of solid rock in your progress estimates for material known as "assembled rock", which is composed of pieces of rock smaller than one cubic yard mixed in with sand and clay and hard pan. What have you to say why this material, not being solid rock, should not be classified as loose rock?—A. I cannot tell you.
>
> Q. You were to be paid for solid rock of a cubic yard and over in size, and you were paid for solid rock which was under a cubic yard?—A. Yes, assembled rock was something I never heard of except on this job.
>
> Q. And when you made your tender on this job you never heard of assembled rock?—A. No.
>
> Q. So that any advantage or disadvantage that might accrue from the adoption of assembled rock was a new feature to you?—A. Yes.

Mr. M. P. Davis in his evidence said:

Q. With regard to classification, did you ever know a solid rock specification in which was included rock fragments less than a yard paid for as solid rock in this manner?—A. No, sir.

By introducing the words "cemented together," the contractors were furnished with a new argument for wider classification, of which they quickly availed themselves. Stones, mixed with stiff clay or packed tightly in sand, were, in their view, cemented together, and seemingly because there was no other description of excavation to which to apply it, the engineers classified under assembled rock vast quantities of stoney material, loosened by blasting, which, without this interpretation they would have classified as loose rock.

From the evidence of the ex-Chief Engineer, Mr. Lumsden, it is clear that if he had received the support of the Commissioners, or if they had allowed him to make his own interpretation, as was his right and duty under the contract, he would have insisted upon the proper classification of the material, and the country would have been saved an improper expenditure of $1,835,051.20.

From the evidence, it will be noted that the solid rock classification, known as "assembled rock" was an innovation to all contractors. They received it because they argued and insisted upon it, and with the assistance of the Commissioners, lawyers and engineers, overcame the Chief Engineer.

The peg on which this assembled rock classification was hung, was the use of the word "masses" in the specification, which it was contended was not limited to masses of rock each of which was over a cubic yard, but included masses of material made up of any size of stones, cemented together by the interstitial material.

The evidence of Mr. Schreiber and of Mr. Lumsden, given before this Commission, and of Mr. Lumsden, given in the Lumsden Enquiry, and of the engineers, who were examined by this Commission, show that they all understood assembled rock to be limited to masses of stones cemented together, and, therefore, if any material which did not consist of stones cemented together by such interstitial material was classified under this head, the engineers gave to the contractors solid rock prices for material which was not even covered by this wide and improper interpretation.

This Commission, in its journey over the La Tuque District, was accompanied by several of the engineers of the Commission, and requested these engineers to point out to it the places where assembled rock was to be found. This Commission failed to find any material on the whole road, which could be classified under the heading of "assembled rock," and the engineers were unable to point out to them any such material. It invariably consisted of stones of various sizes mixed with or packed in clay or sand, none of which had any cementing properties.

On their return to Quebec they took the evidence of the Field Engineers, Ferguson and Porter, who accompanied them, when they testified to that fact (p. 276).

Mr. Collingwood Schreiber, who was examined by this Commission, stated that although he had travelled over the whole line, from Winnipeg to Quebec, he had seen little or no material which could be classified as "assembled rock" (p. 448).

This Commission, therefore, finds that even admitting the assembled rock definition to be correct, there is little or any of what could be allowed as such or that could reasonably be properly so classified, and that this definition was used to allow what under any interpretation of the specification should have been classified as loose rock or common excavation.

In order to determine the amount of money which has been given to the contractors as payment for the excavation of assembled rock at solid rock prices instead of the payment which they should have received had the material been

classified according to the specifications, as we find they should have been interpreted, it is necessary to attempt a reclassification of the total yardage of assembled rock paid for on the Transcontinental Railway.

The Commission endeavored to secure from the engineers records of the actual yardage of boulders of a yard or over contained in the yardage of assembled rock, but it was found that, though the records kept by the boulder measurers were in most instances incomplete, in the majority of cases they covered only a percentage of the work. This was partly due to the fact that boulder measurers were not employed regularly on all residencies, and partly because the boulder measurers did not consider it necessary to measure accurately the boulders, over a yard contained in the masses of assembled rock, in view of the fact that the entire mass was to be returned at the solid rock price.

We find that the question of whether a mass of material was to be paid for at solid rock prices or not depended upon the percentage of stones in the mass. If this percentage of stones was fifty per cent or over, the mass was classified as solid rock. If the stones aggregated less than fifty per cent., the mass was classified as loose and solid rock, the solid rock in this case being represented by the number of boulders or rock fragments each containing a cubic yard or over.

The size of the stones usually did not appear to have any bearing on the matter. They might be solid rock size, which is one cubic yard or over, they might be loose rock size, which is from one cubic foot to one cubic yard, or they might be common excavation size, which covers stones smaller than one cubic foot in volume. The usual requirement in order to return the material as solid rock was that there should be, in the judgment of the engineers, fifty per cent. of stoney material in the mass. Mr. Doucet, however, placed the minimum size at eight or nine inches (p. 359).

The matrix of sand or clay, of which the "assembled rock" was composed up to fifty per cent of the mass, has been given the benefit of the doubt and been taken as loose rock, though the large quantities of this clayey sand indicates that a certain proportion might well come under the heading of 'common excavation.'

In making this reclassification, the results of which are shown in the statement below, the Commission has classified forty per cent of the entire yardage of assembled rock as solid rock and sixty per cent as loose rock, and they feel in so doing they are allowing a far more liberal classification than would have existed had the term "assembled rock" not been invented.

This classification does not apply to District A. for which District Engineer Foss has supplied the information based on his judgment and knowledge of the conditions when the work was being carried out as per the following letter:

"St. John, N.B., Sept. 5th, 1912.

"Gordon Grant, Esq.,
Chief Engineer, 'N.T.R.'
Ottawa.

"Dear Sir:—

"Referring to your circular of August 31st, file 10328, with reference to Boulders included in Assembled Rock, no Boulder measurement was kept, and as regards the percentage of Boulders contained in the Assembled Rock, I am satisfied that on Contract 1, with my knowledge of the cuttings from which this return was made, 50 per cent of this rock would have filled the specifications for Boulders, namely, one cubic yard. The same, I am satisfied would hold true of the small amount returned on Contract 2. On all the other contracts, I think an average of 5 per cent would cover all the Boulders that would be measured by the yard and returned in Assembled Rock statement. This would amount to:

3534 on Contract 1
305 " " 2
1509 " " 3
5175 " " 4
5780 " " 5
3110 " " 6

"Yours very truly,
"C. O. FOSS,
"*District Engineer.*"

The payment of solid rock prices for masses of material which contained only five per cent of solid rock is an example of the latitude taken by the engineers with Lumsden's assembled rock circular to appease the contractors with the knowledge that the Commissioners would approve of it.

The statement then is briefly as follows: The first column shows the yardage of assembled rock returned on each of the districts. The second column shows the cost to the country for this excavation paid for at the contractors' prices for solid rock. The third column shows amounts which would have been paid for this excavation had the classification been based on the percentage classification which this Commission has adopted from the reports and evidence and which they feel is on the liberal side. The difference between the totals of the second and third columns, namely, $1,835,051.20, is the amount which the contractors have, in our opinion, been overpaid.

	Assembled rock returned to date. Yardage.	Cost.	Value at proposed re-classification.
District "A"	305,009	$ 448,645.54	$ 148,637.00
" "B"	2,163,212	3,267,351.75	2,015,805.44
" "C-D"	14,473	27,971.05	17,391.65
" "F"	416,142	705,625.63	432,709.48
	2,898,836	$4,449,594.77	$2,614,543.57

Difference in cost.....$1,835,051.20.

The above overpayments were received by the following contractors:

M. P. & J. T. Davis.....	$397,837.75
E. F. & G. E. Fauquier.....	4,991.00
Grand Trunk Pacific Railway Co.....	283,857.25
Willard Kitchen Co.	125,195.94
Lyons & White	50,063.20
J. D. McArthur	269,527.20
Macdonell & O'Brien	784,979.01
O'Brien, Fowler & McDougall	8,388.95
O'Brien, O'Gorman & McDougall	4,903.90

Classification of Loose Rock and other Material.

Paragraph 35.—Under these specifications, clay and other materials, of a certain degree of hardness are to be classified as loose rock. The test of this degree of hardness is that if in the judgment of the engineer, the clay or other material is so hard that it cannot be ploughed, with a ten inch grading plough behind a team of six good horses properly handled, and without the necessity of blasting, though blasting may be occasionally resorted to, it is to be classified as loose rock.

The engineers of the National Transcontinental Railway paid little attention to that portion of clause 35, which defined this test. A number of them have stated to this Commission that they did not consider it a test at all, but that they considered if the material for any reason could not be practically ploughed

it came under the heading of loose rock. This is obviously an erroneous reading of the clause, for under that interpretation a bank of sand, so located that it was impossible to get horses to it, or on account of being on a very steep slope impossible to plough it, would come under the heading of "loose rock" as far as the test of hardness was concerned.

The cost of excavating and removing of the material to the contractor, was the feature which governed the loose rock classification. This is a dangerous basis to work on, and has resulted in this case in improper returns, and increased profits to the contractors over and above what they are justifiably entitled to.

On contracts Nos. 13, 14, 15 and 16, east and west of Cochrane, the country through which the line passes is composed almost entirely of clay of varying degrees of hardness and it was to cover just such material as this that the test for hardness was inserted, so that the engineers would have a definite rule to work by and so the contractors, when tendering, might regulate their prices to cover the material as described.

Mr. A. T. Tomlinson, Inspecting Engineer for the Grand Trunk Pacific Railway over this territory, said that all classification was based on cost and that he ignored the specifications (p. 423).

Mr. H. M. Balkam, District Engineer of District CD, gave the opinion that a team of horses could pull a plough through most of the clay in his district (p. 317).

The other engineers examined by the Commission, confirmed its opinion, already formed by inspection of the various cuttings, that an enormous quantity of clay had improperly been returned as loose rock, under these specifications.

The reclassification of the material excavated on Contracts 14, 15 and 16, based upon the specifications, shows that the contractors have been overpaid for this item to an extent of over $750,000 (p. 379).

The overpayments for this ploughable clay was distributed among the contractors as follows:—

M. P. & J. T. Davis	$155,000.00
E. F. & G. E. Fauquier	223,500.00
Grand Trunk Pacific Railway	373,000.00

Overbreak.

The term "Overbreak" is an engineers' name (not used in the specification), applied to such solid rock as the contractors remove from outside of the prescribed slopes of cuts. The specifications prescribe a width of 18 feet in the bottom of the cuts, the sides of which were to be on a slope of 1¼ feet to 1 foot. The engineers marked out the ground by stakes, showing the limits of the proposed cutting, so that the contractors knew exactly what material they were to take out, and any material removed outside of these lines is called "Overbreak", i.e., unauthorized excavation in rock cuts.

Paragraph 37 of the General Specifications covers overbreak:

> "37. *Material in slips, slides and subsidencies extending beyond slopes* "in cuttings will not be paid for unless, in the opinion of the engineers, such "occurrences were beyond the control of the contractor, and not prevent- "able by use of due care and diligence." See Exhibit No. 10.

The terms "slips" and "slides" mean overbreak in rock cuttings, and, according to the above paragraph, any such which is avoidable must not be paid for.

"Avoidable overbreak" is usually caused by the use of excessive quantities of explosives.

"Unavoidable overbreak" means rock, outside the prescribed section, which because of natural seams or cracks existing prior to the blasting, slips, or slides into

the cutting, as soon as the rock in the cutting, which supported or kept it in place, is removed, and thus occurring through no fault of the contractor, he is properly paid for removing it from his cutting.

Under the specifications the engineer is to classify this material as he finds it after it falls into the cutting, that is, he is to pay solid rock price for fragments larger than a cubic yard and loose rock, for those less than a cubic yard.

In District B, east and west of Quebec, out of 3,206,571 cubic yards, 837,230 yards were overbreak, an amount of overbreak equal to 35.3 per cent of the rock excavation inside the slopes.

In District F, from Peninsula Crossing to Winnipeg, out of 6,352,940 yards, 1,688,244 were overbreak, or an amount of overbreak equal to 36 per cent of the rock excavation inside the slopes.

In many of the individual cuttings in both these districts, the overbreak ran up to 50 per cent. It is considered that an allowance of overbreak equal to 20 per cent of the amount of rock excavation inside the section is a liberal allowance to the contractor as "unavoidable overbreak".

The engineers allowed all overbreak to the contractors and certified that they should be paid solid rock prices for it, ignoring entirely the provisions of paragraph 37 and of paragraph 38, which provides "the classification of material from slides shall be made by the engineer, and will be in accordance with its condition at the time of the slide, regardless of prior conditions".

It will be noted that the contractor is not to be paid for any material which he takes out of the cut unless it is something which either unavoidably slid or slipped into the cutting. Here we gave a glaring example of reckless disregard of duty.

Under paragraph 24 of the agreement between the Grand Trunk Pacific and His Majesty the King, being Schedule to 3 Edward VII, Chapter 21, disputes between the Government and the company are to be referred to arbitration, and the Grand Trunk having protested against these allowances for overbreak, three arbitrators were agreed upon to endeavor to settle the amount of overbreak which should be allowed. The arbitrators went over Districts B. and F. and revised the estimates. They found that most of this overbreak had been used to make embankments, that is to fill up depressions, which it had been intended to have crossed by standard wooden trestles. They allowed solid rock prices for that part which they considered unavoidable, and for that part which they considered avoidable, they allowed for each yard of solid rock the price of a yard and a half of train hauled earth, and for whatever amount of unavoidable overbreak they estimated had been wasted, that is not used in the line, they allowed nothing.

The result of the arbitrators' findings and the classification made by the engineers subsequent to these findings, is shown in a statement appended hereto. The net result of these reclassifications was the reduction of the contractors' estimates by $561,311.84, which amount they would have otherwise received. (See exhibit No. 18.)

If the Commission had adhered to its original intention to use standard trestles and the contractors had not been encouraged to this reckless making of overbreak, by knowing that they could use this costly material for fills and receive solid rock prices for it, in all probability they would have been reasonably careful and this unprecedented condition of affairs would not have arisen.

This Commission on its inspection compared the original classification and the arbitrators award with the cuttings on the ground, and is of the opinion that the arbitrators instead of classifying strictly in accordance with the specification made a compromise between the award made and that which should have been made, and in our opinion the arbitrators' award is more liberal to the contractors than it would have been had the arbitrators made the original classification.

The item of train filling in for rock classification is not included in the contract and general specification. It was the result of trying to find some legitimate

way to pay for avoidable overbreak when the material had been used in the fills adjoining the rock cuts, and is justified on the ground that it relieved the railway from making the fill of some other material and the contractors should, therefore, receive an amount equal to what it would cost to make these fills from train fill or borrow. (See Train Fill.)

It is clear that when the contractors are paid a profitable price for the removal of rock that the larger the quantity to be removed from a given cutting the larger will be their profits.

The time to have prevented this large amount of overbreak was when the engineers made their early estimates. They should have made it apparent to the contractors that they would not be paid for this excess material. Instead of doing so, however, they allowed all of the overbreak and classified it as solid rock. This gave the engineers a larger amount of material for fills over depressions than they expected, and had the further effect of filling many of these depressions with solid rock which would otherwise have been filled with cheaper material, or would have been crossed by means of wooden trestles, i.e., fills were made by unauthorized excavation by the contractors on their own responsibility, and because the material was so used, the engineers and the arbitrators passed the estimates for it the same as though it were legitimate excavation. When the contractors found that they were to be paid for all material excavated, whether inside or outside of the section, there was no incentive for them to use care and diligence as called for in the specifications to prevent these slips and slides, but there was a premium put upon this wasteful method which the contractors readily seized because it gave them larger profits, equal in principal to the amounts shown in the statement above referred to.

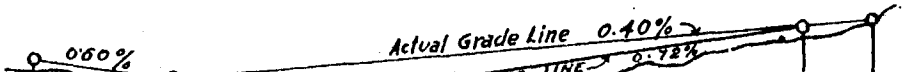
For evidence in connection with "Overbreak", see pp. 370, 394, 504, etc., etc.

MOMENTUM, VIRTUAL OR VELOCITY GRADES.

Railways cannot always be built on the level, and rises in the line are called "grades", of which there are two classes; first, "Actual grades", and a second class of grade called indifferently "Momentum", "Virtual" or "Velocity" grades. Not to introduce momentum grades in a line of this standard is to manifest careless ignorance of modern railway construction.

An "Actual grade" is where a line passes over a given distance from a lower to a higher point on the same slope for the entire distance.

A "Momentum", "Virtual" or "Velocity" grade can be more readily understood by an examination of the following diagram:



The above drawing shows an actual grade line over a distance of 3,500 feet and shows the construction of a momentum grade line on the same location. For a momentum grade the line is so constructed that a freight train approaching the momentum grade passes for 1,000 feet over a 0.6 per cent down grade, and so gets a "run at the hill." The train moving at ten miles an hour when it enters on the down grad increases its speed by momentum so much that when it arrives at the 2,000 feet level stretch it is moving

at eighteen miles per hour, and when it arrives at the foot of the "momentum" grade it is moving at twenty miles per hour, but when it arrives at the top of the "momentum grade" it is back to ten miles per hour. It will be seen therefore that the momentum which the train acquires in passing from the top of the 0.6% grade to the bottom of the "momentum" grade has increased its speed by ten miles, and this momentum helps it over the 0.72 grade without making any greater pull on the engine than required to take it over the actual 0.4 grade which reaches the level with the 0.72 grade a virtual 0.4 grade, all of which is shown on the diagram.

"Momentum" grades are introduced to save money in construction by lessening the fill or cut as the case may be. In this case it is a fill. If the "actual grade" is taken the fill in this case is from the ground line shown on the diagram up to the "actual grade" line. If the "momentum grade" line is taken the expense of filling between that line and the "actual grade" line is saved. In this case the saving is about 40,000 cubic yards.

The use of "momentum grades" was suggested to Chief Engineer Lumsden by Assistant Chief Engineer MacPherson, after he had taken the matter up with Mr. Woods of the Grand Trunk Pacific Railway and the Principal District Engineers of the National Transcontinental Railway.

Mr. Woods, in his reply of August 14th, 1905, to Mr. MacPherson, discouraged their use in the following language. (See Exhibit No. 19.)

> "I beg to say that we have not considered momentum grades in any way on our located lines, and I question the utility of doing so on grades as low as we are using."

Chief Engineer Lumsden's ruling of November 21st, 1905, that "We must adhere to actual grades so far as our construction is concerned, and all District Engineers should be so instructed. Should any exceptional cases arise, they should be submitted to this office, but you must bear in mind that they must be approved by the Grand Trunk Pacific Railway Company before they can be adopted", was the positive decision against their use, as the Grand Trunk Pacific Railway, through Mr. Woods, had already expressed themselves as being adverse to their introduction.

The evidence establishes the fact that momentum grades are as efficient as actual grades, for over both grades trains of the same weight, carrying the same tonnage, can be transported by the same locomotive at the same cost, and with the same degree of safety and comfort, and the evidence also establishes that had momentum grades been used in the location and construction of this railway, the cost of this construction might have been reduced by millions of dollars.

The evidence also is that it is in the location of the road and the adoption of the various lines run, based upon the best procurable grades, that the largest saving can be made from the introduction of momentum grades, and that any reduction in cost which might be made possible by introducing momentum grades on the profile of a located line would be insignificant in comparison with the saving which might have been effected had the locating engineers been permitted to practise this economy.

Mr. W. F. Tye, consulting engineer, formerly Chief Engineer of the C.P.R., in his evidence states that this saving on a railway like the Transcontinental would amount to millions of dollars. Other engineers, whom this Commission examined, estimated the probable saving as being from seven to twenty per cent of the cost of the grading.

As to the use of momentum grades, Mr. Tye says (p. 470):—

> "The use of momentum grades will not in any way degrade the standard of the road. They would not reduce the haulage capacity of the loco-

motives by one ounce, would not increase the running time of passenger or freight trains by one minute, and would not increase the operating expenses by one dollar—on the contrary, they would, by decreasing the cost of construction, reduce the fixed charges and so improve the commercial effectiveness of the road.

"If the result to be arrived at by the construction of the Transcontinental was to provide a means of handling traffic between the east and the west and vice versa at lowest cost, the use of momentum grades would certainly be a means to this end, and would be an improvement in the standard of efficiency of the road. They would certainly reduce the total cost of handling and so tend to permit of lower freight rates."

The following engineers, who, excepting Mr. Tye, have been, many of them, for years employed in their professional capacity in the construction of the railway, testified strongly in favor of the use of momentum grades, some of them had recommended them and all were of opinion that they should have been and could have been used without in any way lowering the standard or impairing the usefulness of the road; W. F. Tye, Consulting Engineer, and late Chief Engineer of the Canadian Pacific Railway; Gordon Grant, Chief Engineer of the National Transcontinental Railway; G. L. Mattice, Assistant District Engineer, District C. D.; H. M. Balkam, District Engineer of District C.D.; R. R. Holland, Division Engineer, District C.D.; A. N. Molesworth, late District Engineer, District C.D.; C. O. Foss, District Engineer, District A.; J. W. Porter, Assistant District Engineer, District B.; Duncan MacPherson, Assistant to Chairman, Transcontinental Railway; A. E. Doucet, District Engineer, District B.

Mr. Lumsden had no experience with momentum grades, as their use had only become imperative since the adoption by railways of low rates of gradient.

Had the Commission included among its members gentlemen who had had experience in modern railway construction and operation, we have no doubt but that the Commission would not have forbidden but, on the contrary, would have encouraged, the use of momentum grades, and we entirely agree with Mr. Tye when he says (p. 468):—

"If momentum will be used by the operating officials in any event (and it is undoubtedly used on practically every road in the continent) it seems silly not to apply the theory in a scientific manner on construction and take advantage of the undoubtedly large saving in construction expenses."

The cost which covers the excavation of the cuttings and the formation of embankments, amounted to approximately $62,000,000 by December 31st, 1912, and we conclude that at least ten per cent of the sum, namely, $6,200,000 was lost to the country by reason of the neglect to use momentum grades.

ALIGNMENT.

The instructions to engineers limited the curvature to six degrees—and also limited the minimum length of tangent to 300 feet. (See Exhibit No. 1.)

These hard and fast rules applied in the location of a railway 1800 miles in length had the effect of increasing to a very great extent the cost of construction.

We find that in expensive locations on railways of this character, curves up to ten degrees without tangents between spirals is good practice.

On District B in the 200 miles west of the Quebec Bridge, an additional expenditure of about $602,000.00 was undertaken in keeping within the limits prescribed by these rules. This mileage is about one-quarter of the rough country through which the railway was built, and we estimate that on the entire railway at least $2,400,000.00 has been expended in maintaining this light curvature alignment, which Mr. W. F. Tye, C.E., says is of "absolutely no value whatever". We quote here from evidence given by Mr. W. F. Tye:

Q. Would you have recommended a modification in this original instruction concerning a maximum degree of curvature?—A. The rule is a reasonable one to be included in the general instructions, but it should have been modified by a circular to the effect that where the use of curves sharper than six degrees would result in a large saving, surveys should be made and detailed estimates submitted showing the amount of such saving. No curves sharper than six degrees to be used without the express sanction of the Chief Engineer in each case.

Q. Would any large saving have been effected had this latitude been given in the construction of the railway?—A. There cannot be any doubt that in rough crooked country this rule rigidly adhered to especially in connection with the rule making the minimum length of tangent between the ends of easement curves 300 feet, must have resulted in tremendous expenditures that are of absolutely no value whatever.

And further in connection with these rules and particularly as regards the rule limiting the length of tangents, Mr. Tye says:

A. Such a rule is decidedly expensive on construction in a rough crooked country, such as is much of the country traversed by the Transcontinental. I have been trying mentally to apply it to some of the rough country through which I have located railways and I confess the thought appalls me. I am certain many many millions must have been spent in this way to produce results that are absolutely valueless or to speak more correctly are worse than valueless.

The District Engineers on Districts A, B, and F, have also pointed out to this Commission that the restrictions with respect to the curvature had the effect of increasing the cost of the railway in their respective territories, and as engineers would recommend greater latitude where rough country is encountered.

STANDARD WOODEN BRIDGES, EMBANKMENTS, STEEL AND CONCRETE BRIDGES.

In the construction of a railway, depressions in the surface of the ground which are lower than the intended grade line of the railway are either crossed by bridges of some kind or fillings called "embankments" of earth, rock or sand.

Bridges are either wooden trestles or steel and concrete structures of various kinds. There are, of course, many places in a long railway where it is not necessary to construct bridges across the depressions, as the object of the permanent bridge is to provide an opening for the passage of water or roads under the railway, and in these places the depressions are crossed by "embankments", sometimes many thousand feet in length.

If there are any adjacent high places through which the road is cut, the material taken from these excavations is used so far as it will go to form these embankments. Where there is not sufficient material obtainable from the excavations on either side of the depression, and material to form the embankments has to be brought from a pit or elsewhere, it is called "borrowed material" and if it is brought from such a distance as to make it necessary to carry it to the place by train, it is called "train hauled filling."

Where the material hauled by train is "common excavation", that is earth and sand, it is called "train hauled filling" simply; where the material so hauled is loose rock or solid rock, it is called "classified train haul".

The contractor agreeing to take out excavation must necessarily carry it a certain distance and on this railway, where he carried it for 500 feet or less, the carriage was included in the price per yard for excavating, and he was paid where he transports it by men or teams one cent per cubic yard for haul for each additional 100 feet or less, which he carried it. The first 500 feet is called the "free haul".

Where deep depressions are to be filled with material hauled by train from some distant source, "temporary trestles" of rough material are first thrown across them, just strong enough to carry loaded trains, which are then run on to the trestle and the earth unloaded from the train until the depression is filled, and the trestle is left buried in the embankment.

In the original construction of all modern railroads, standard wooden trestles have, on account of the present and ultimate enormous saving effected by their use, been invariably installed instead of train hauled embankments, or steel or concrete bridges, it being well recognized that after the railway is completed train hauled embankments to replace these trestles can be made at less than half the cost which would have been incurred by making them during construction, and that generally steel structures are not only unnecessary during the first few years of the railway's operation, but that after construction is completed and the railway is equipped and in operation, they can be more cheaply hauled to the site and more economically installed.

Further where local conditions are unknown many mistakes are bound to be made respecting the size of openings and reliability of foundations for heavy structures, and sinkholes, slides and washouts develop which ignorance of local conditions made it impossible for the engineers to anticipate. Where trestles are used engineers have time to become familiar with the country. The railway itself drains the ground before loading the line with heavy structures. Already on this line where the structures are put in they have had to be renewed more than once by reason of sinkholes, washouts and other misfortunes which would have been avoidable with the knowledge gained by experience.

The Commission was well aware before it decided to make embankments with "train hauled filling" that the cost per cubic yard would be more than double during the construction that what that cost would be if made after the railroad was completed, and we find that it was originally intended to construct wooden trestles instead of permanent concrete and steel structures and instead of embankments over depressions in the roadbed that could not have been filled with material from the adjoining cuttings or with borrow within short haul.

The Minister of Finance, in discussing in the House of Commons the policy of construction to be followed on the Transcontinental Railway says: (Hansard, Aug. 12th, 1903, page 8574.)

> "Now we know that in the construction of a road, in the anxiety to get a railroad built some things are done which may be regarded almost of a temporary character. In one place, you put in a trestle, which five or six years later you will fill up and make a permanent road. In another place, you put in a small wooden bridge; in time, when it commences to weaken, you put in a steel structure, and so on. The road is not finished when its nominal completion takes place but it may be finished as time progresses."

And on the same page:

> "We will give them a completed road as far as any new road can be made so, but as years roll on, if the Government be in the same position as the landlord to whom I referred, desired to make embankments on the road, if they desired, having regard to the permanence of the road to take out a wooden bridge and put in a steel structure, if they desired to fill up a trestle or do one of the many things which hon. gentlemen opposite, who are familiar with railways, will understand better than I do, then the Government will have the right to do that in the way of betterment."

The first grading contracts (Nos. 9 and 10, Quebec Bridge and westerly 150 miles, Hogan & Macdonell, and No. 21, Peninsula Crossing to Winnipeg, J. D. McArthur) contained no item in the schedule of prices for train hauled filling of any description, nor was any yardage of this material included in the Chief Engineer's estimate of quantities on these contracts. (See Exhibit No. 20.)

Before these contracts were let Mr. Lumsden advised the Commission that it should be made clear to the contractors that they would not be paid anything above the prices fixed for common excavation for any kind of train hauled filling or temporary trestles. Mr. Lumsden's correspondence with the Commission and the Grand Trunk Pacific Railway put it beyond controversy that it was originally intended to use standard trestles instead of train hauled filling. Mr. Schreiber, who made the original estimate, intended to use wooden trestles; Mr. Fielding, in his explanations to Parliament, contemplated them; the Grand Trunk Pacific Railway Company not only approved of wooden trestles which it used throughout its own road west of Winnipeg and on the Fort William Branch, but by a formal resolution of its Board agreed that when they were worn out it would replace them by embankments at a cost not to exceed 25 cents per cubic yard for train hauled filling, which was less than one-half the price paid by the Commission. (See Exhibit No. 21.)

The correspondence and the evidence, therefore, indubitably show what was the intention as regards this feature of construction, and we have endeavored to find a reason why this so sensible and economical principle was abandoned. There is no official record of exactly when the Commission abandoned standard wooden trestles; it seems to have slowly drifted from or to have forgotten its original intention, as appears by what follows:

In a letter dated 9th June, 1906, from Mr. A. E. Hodgins, District Engineer, to the Chief Engineer, the first signs of the coming change appear:

> "Mr. McArthur has raised the question who will pay for temporary trestles if train hauled filling is ordered in heavy fills. He is very anxious to do train filling west of the C.P.R. crossing in place of permanent trestles. He has not put in any price for temporary trestles and claims that his price per cubic yard for train filling does not include anything but the loading and offloading material for banks from flat cars."

As before stated, Mr. McArthur's contract did not provide for train hauled filling, and he is evidently referring to Item 74 in the Schedule (Train Hauled Surfacing), which is the gravel used for finishing the grade around the ties, and for which he was paid 30 cts. per cubic yard. Mr. Lumsden, in his reply, points out that:

> "It was not the intention that the present contractor should be called upon to make very heavy fills, the material for which would have to be hauled by train, but that he should put in standard trestles in such places. Of course, if the contractor prefers to make up a fill by train-hauled filling, rather than put in the standard trestle, he can do so with your approval, and in such cases he must provide the necessary temporary trestle at his own cost (except under clause 17, headed temporary bridges or haulway)."
> Letter dated June 12th, 1906.

On November 5th, 1906, Mr. A. E. Doucet, District Engineer at Quebec, wrote that Mr. M. P. Davis was asking him for bills for timber for wooden trestles at eight locations mentioned in the letter, and points out that to give this information opens up the question of temporary trestles and train hauled material, concerning which no decision had as yet been come to, and argues that, as train hauled filling had not been provided for in the contract, they were at the contractors' mercy, and should have to make the best of a bad bargain.

Some verbal discussion appears to have then taken place between them, because on November 12, Mr. Doucet enclosed a letter from Mr. Davis, asking Mr. Lums-

den to make a price for train hauled filling, and in his reply of December 4, the Chief Engineer says that in his opinion if the present contractors were allowed an addition to their ordinary earthwork price (21 cents per cubic yard) of 15 cents per yard on all train hauled material to make embankments (other than ballast), with an addition of one cent per yard per mile for haul over five miles, such an arrangement would be a fair and equitable one between the contractors and the Commissioners, for train hauled filling hauled by train for a distance over 2,000 feet.

Mr. Lumsden now appears to have lost sight of the fact that he had laid down a policy of constructing standard trestles where large fills were encountered. The contractors, apparently assuming that they were in the comfortable position spoken of by Mr. Doucet of having the Commission at their mercy, promptly refused this offer and claimed that they were entitled to be paid, unless a special price were made, common excavation price, plus one cent per 100 feet overhaul, and as some of this material had to be brought four or five miles, it put up the price to perhaps $2.50 per yard. Of course, this contention was entirely wrong, as the 100 feet overhaul clause only applied to material which was hauled by teams and men and not by train.

Mr. Lumsden, in his evidence, told this Commission that on the 14th of December preceding, at a meeting in Quebec, with Messrs. Davis Bros., Macdonell and O'Brien, the Chairman, Mr. Doucet, Messrs. Wood and Armstrong, the Grand Trunk Pacific supervising engineers, he eventually consented to a price of 55 cents per cubic yard, which in his opinion, "is a very good one" (p. 404).

With the approval of this price for train hauled filling, the contractors were furnished with an excellent money making substitute for wooden trestles. In the meantime, difficulties had arisen on Mr. J. D. McArthur's Contract, No. 21, in connection with the scarcity of material for constructing embankments, and the result of the correspondence between Mr. McArthur, the District Engineer and the Chief Engineer, was the submission of a price by Mr. McArthur of 52 cents per cubic yard for train hauled filling, including temporary trestles, which offer was approved by the Commissioners on May 27, 1907.

After these arrangements had been made with the early contractors, the specifications were revised by the insertion of clause 224X, which covers train hauled filling, so that in all the grading contracts, other than 9, 10 and 21, this item was tendered upon by the contractors and prices fixed before the contract was awarded, and we thenceforward hear no more of wooden trestles.

An estimate has been compiled (see Exhibit No. 22) showing the saving which might have been effected by the construction of wooden trestles instead of embankments and permanent openings at 150 locations between Moncton and Winnipeg. The costs of the embankments and permanent structures have been supplied by the district engineers of the Transcontinental Railway. Likewise the estimated cost of constructing wooden trestles at these locations has been figured by these engineers, the contract price for this work being used, except in two instances, where the price for lumber in trestles ran from $80 to $90 per thousand feet board measure. On these two contracts, the estimated cost of the trestles has been arrived at by using a price of $50 per thousand feet for lumber, which is considered a fair and reasonable price for this class of work, and is in excess of the contract price for lumber in trestles on some other contracts. The life of the wooden structures has been assumed to be only seven years, though as a fact it is really much longer, and consequently the amount we show to have been saved is considerably less than would have actually resulted.

In the columns covering the estimated cost of the fill and structure, if undertaken in 7 years the train filling has been figured at 25 cts. per cubic yard, which is the sum for which the Grand Trunk Pacific Railway Company offered to do the work in the event of the Commissioners deciding to construct wooden trestles.

The cost of the masonry structures has been reduced to 80 per cent of what they did cost to construct at the existing contract prices, for the reason that the prices at which this concrete work was sublet by the main contractors provided for them profits in excess of 20 per cent, and in seven years time when the Transcontinental Railway would be in operation and easily accessible at all points, this work could be undertaken and completed at the prices paid the subcontractors, thereby eliminating the heavy profit-taking which added so much to the cost of this work.

The Act, under which the Transcontinental Railway is being constructed, provides that the rate of interest to be paid on any loan to be raised for this work shall not exceed 3½ per cent per annum. The records show that Canadian Government 3½ per cent bonds have brought on the market from 90 per cent to 95 per cent of par value. This feature increases the interest charged to approximately 3.8 per cent, so that a 4 per cent charge has been used in this statement as being the nearest figure to the actual cost to the country in interest charges on the amounts expended on permanent structures and embankments.

By reference to Exhibit No. 22 it will be seen that at the end of seven years, had wooden trestles been constructed at these 150 locations, the saving would have been $6,967,284.00, and if the Government had then decided to put in steel and concrete bridges and embankments in place of these trestles the work could have been done for $3,534,701.00 less than it actually cost and after deducting from this the cost of the original wooden trestles there would have been an ultimate saving of $2,947,227.00. It is estimated that the completion of the road has been delayed several seasons by not installing wooden trestles, resulting in a loss of interest amounting to over $1,000,000.00.

A detailed statement has been compiled showing the additional expense incurred owing to slips, slides, subsidencies and washouts where heavy embankments were used to convey the railway over soft muskegs, silt and soft clay deposits. The total cost of repairing these embankments was $1,376,910.43. Many of the locations where the additional money has been expended are included in the "Wooden Trestle" statement above referred to, and the cost of the fills as shown is thereby increased, for had these treacherous places been crossed by means of trestle bridges supported on piles, the engineers would have had eight or ten years to study the conditions and provide drainage, and in many cases the drainage and clearing would have dried out and hardened the surface of the ground sufficiently to carry the embankments without the subsidencies, slips and slides which have occurred and which have caused this additional cost.

It may be argued that the fire risk in connection with the wooden trestles in a new country was sufficient to justify the enormous expenditure necessary on account of their omission. The answer to this is, that the fire risk could have been reduced on this railway in the same manner as on the Grand Trunk Pacific Railway and other Canadian lines by clearing the combustible material in the vicinity of the bridge for such a distance as to make communication from forest fires to the structure itself impossible, and from other causes by watchmen, water supply and fire resistant paint, as provided in the instructions of the Board of Railway Commissioners.

By reference to the contract with the Grand Trunk Pacific Railway, it will be found that trestle repairs and protection against fire and renewals on account of fire come within the cost of maintenance to be borne wholly by it, so that their maintenance does not figure in their ultimate cost to the Government.

It has been intimated to us that the Commission had no option under the statute creating it and authorizing the construction of this road. In other words they were in duty bound quite irrespective of cost to deliver to the Grand Trunk Pacific Railway Company a railway completed in every respect. There is no pro-

vision of the statutes which requires or authorizes the Commission to make any unreasonable or unnecessary expenditure in the construction of this road. They were given a free hand and could not have been criticized had they proceeded along lines followed by prudent railway companies constructing high class roads who recognize cost as an element to be respected, and they cannot point to any railway in Canada or to any similar undertaking in the United States as a justification for their enormous expenditure on embankments and permanent bridges. A completed railway means to any reasonable person one over which traffic may be safely and advantageously carried, and cannot mean one on which all conceivable capital expenditure has been made because in the wider meaning of the term railways are never completed.

In our investigation we do not find that the question of economy in the matter of construction of wooden bridges was ever seriously discussed between the Commission and its officers, and we do find that when it was understood by the engineers in the field that all fills should be completed at once they found it necessary to borrow large quantities of rock with which to complete these fills, as shown in the statements covering overbreak and rock borrow, this material costing the country four times what filling would have cost later had the policy of wooden trestles been adopted. (See exhibits 18 and 23.)

The construction of embankments opened wide the gate of recklessness in overbreak. If wooden trestles had been used where the material within the prescribed slope lines in cuttings was insufficient the contractors would have had no profitable way of disposing of the enormous quantities of rock which they unnecessarily took out over hundreds of miles of the line, and so would have been careful to remove the least possible.

Had wooden trestles been used undoubtedly a further saving would have been made in the cost of culverts and bridges, over water courses because their size had to be determined before the engineers had any reliable knowledge of the height to which the water from year to year might rise in the streams, so they in the interests of safety constructed the openings of a larger size than ten years of experience might have shown to be necessary.

While it is not possible to prophesy what might have been the saving under this head, it is certain that a few years experience and knowledge of the country would have shown that smaller and more economical structures would be used in many places.

Had the locating engineers been instructed that the use of wooden trestle bridges was contemplated, it would have influenced their location in such a manner as to reduce the amount of material excavated from the adjoining cuttings, that is, instead of endeavoring to make their cuts and fills balance, they would have located the line in the most economical manner.

As an example of the enormous profits realized by the contractors upon the item for train hauled filling it is pointed out that Contract No. 7, the main contractors M. P. & J. T. Davis sublet this work for 28 cents per cubic yard and received 40 cents per cubic yard from the Government. At these prices the quantities handled would give them a profit of over $225,000 on this item alone. Similarly on Contract No. 8, where they received 45 cents per cubic yard, and the returns here would indicate a profit of $432,000.

The total yardage of train hauled filling paid for on the Transcontinental Railway up to December 31st, 1912, was 25,958,130 cubic yards, which cost at the contractors' prices for this work $13,537,924.68.

This material has been used in the construction of embankments, where it was found impossible to procure sufficient material from the adjoining cuttings. The locations dealt with in the trestle statement account for about 13,000,000 yards

and the balance of this train hauled filling has been generally used in bringing shallow embankments up to the grade line and for widening embankments to the width called for by the specifications. We have been told that a great deal of unnecessary material went into the construction of this road.

In view of the fact that the train hauled filling was proving such a heavy expenditure the Commissioners should have taken steps to ensure that the grade line be kept as low as possible, sags introduced in heavy fills and embankments only widened to what was necessary to make them safe for traffic, and in doing this they would have been following Mr. Fielding's intentions as regards the construction of the road, and the practice of all responsible railway companies whose object is the economical construction of a high class efficient railway. Had the work been undertaken in this manner and finally completed at the Grand Trunk Pacific Railway Company's rate of twenty-five cents per cubic yard (at which rate they offered to fill wooden trestles) the country would have saved in contractors' profits alone the sum of $3,250,000.00.

BUILDINGS.

The following buildings erected on the Transcontinental Railway have been constructed according to the designs supplied by the Grand Trunk Pacific Railway Company (p. 415): Engine houses and machine shops, coaling plants, sand houses, trainmen's rest houses, store and oil houses, ice houses, freight sheds, way stations, divisional point stations, section houses, section tool houses, water tanks.

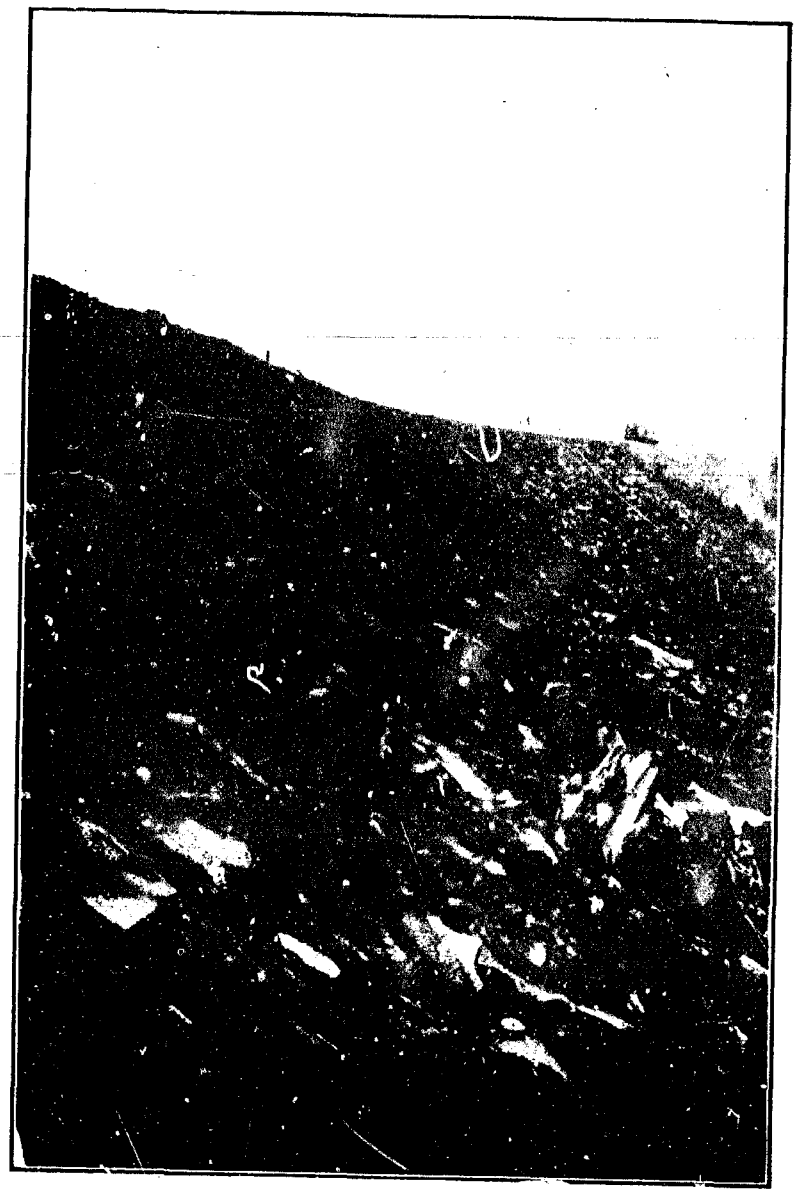
Of these buildings, the engine houses, section houses and water tanks were included in the general grading contracts, and separate contracts were let for the other structures.

Engine Houses.

There are sixteen divisional points on the Transcontinental Railway, between Moncton and Transcona, and including these two points. The following statement supplied by Mr. W. J. Press, Mechanical Engineer of the National Transcontinental Railway, shows the location and through mileage of each divisional point with the capacity of the engine house to be erected, together with the estimated cost:

District.	Through mileage.	Location.	Number of stalls.	Estimated cost (including heating but not boilers).
"A"	1.0	Moncton	12 stalls and machine shop.....	$100,000
	117.5	Napadogan	12 stalls and machine shop.....	110,000
	330.0	Edmundston	12 stalls and machine shop.....	100,000
"B"	355.4	Laurier	12 stalls without shop.....	90,000
	460.4	Quebec	12 stalls without shop.....	110,000
	586.9	Fitzpatrick	12 stalls	90,000
	705.8	Parent	12 stalls and machine shop.....	110,000
	808.8	Doucet	12 stalls	100,000
"C"	916.7	O'Brien	12 stalls	95,000
"D"	1028.8	Cochrane	12 stalls and machine shop.....	110,000
	1157.8	Hearst	12 stalls	100,000
"E"	1282.8	Grant	12 stalls and machine shop.....	120,000
	1413.2	Armstrong	12 stalls	95,000
				(Including heating apparatus and boilers.)
"F"	1552.1	Graham	18 stalls and machine shop.....	$205,000
	1675.8	Reddit	12 stalls	95,000
	1800.0	Transcona	24 stalls	135,000
		Total estimated cost.....		$1,765,000

District B, Residency 14, Mileage 29.6. Assembled Rock. Page 68.



District A, Mileage 46.0. Portion of Coal Creek Hill, Looking East. Page 96.

In the standard forms of tender and contract covering the general contracts, the construction of engine houses is included as part of the work to be performed by the contractor. (See Exhibit 10.)

That is each grading includes the construction of the engine houses which may be located within its particular mileage.

The items, however, in the contract schedule, do not cover the various classes of work which it is necessary to pay for in the construction of an engine house, and those which are common to both classes of work are so defined in the general contract as to make them inapplicable to engine house construction. For instance, lumber in the general contract is allotted to trestles, culverts, cofferdams, and plank in highway crossings, and the various mixtures of concrete are specified for culverts, bridge abutments, and walls of buildings (1-4-8), which latter mixture is too poor to be considered in first class construction of any nature. There are only two items in the general contract which might have been used in the engine house schedule, and these are Item 60, concrete 1-3-5, including forms and Item 61, concrete 1-3-6, including forms. The use of these mixtures of concrete is not tied down to any particular form of construction. The Commissioners of the Transcontinental Railway took the view that as these buildings were included in the definition of the work to be performed by the general contractors, that it was essential for the work to be awarded accordingly. It became necessary, therefore, to arrange with the various contractors a schedule of prices covering the work to be undertaken, and in doing so the Commission occupied the unfortunate position of having awarded a contract for the work with no mention made of price or cost.

Some of the rates contained in these schedules submitted by the contracts and approved by the Commissioners are very high, viz; concrete at seventeen dollars per cubic yard, which Mr. Monsarrat considers should have been amply paid for at twelve dollars; brickwork, thirty-four dollars, forty and forty-four dollars per thousand; and lumber at seventy and seventy-three dollars, per thousand feet board measure.

In order to arrive at a conclusion as to whether these high prices were justified by the distance and isolation from mercantile centres of the locations where these buildings have been erected, the Commission secured the services of Mr. Thomas Tompkins, building contractor of Ottawa, to investigate and report on the general contractors, together with a section of main line grading through particularly from the contractor's point of view.

Mr. Tompkins' report is as follows:

"Ottawa, November 25, 1912.

"The Transcontinental
Investigation Commission.
Ottawa, Ont.

"Dear Sir,—

"Acting on your instructions of September 20, I visited Transcona, Reddit, Graham and Cochrane, all divisional points on the National Transcontinental Railway, and made a practical study of engine house construction, costs and conditions at these locations. I now beg to hand you a report dealing with Graham engine house, boiler room and machine shop, as being a representative example of the manner in which the work is being done.

"This contract was let to Messrs. O'Brien, Fowler & McDougall Bros., general contractors, together with a section of main line grading through Graham.

"According to the final estimate for this work at the prices contained in the approved schedule, the entire structure, engine house, machine shop, fan room and boiler room, has cost $203,911.78.

"The construction of this building was sublet by the main contractors to Messrs. Farlinger and McDonald, sub-contractors, at prices which show a clear profit for the main contractors of $50,446.19, without doing any work. This profit was nearly all made in the concrete work for which the main contractors received $17.00 per cu. yd. and the subcontractors $10.00, the total cost of the concrete in this building being $90,191.

"Messrs. O'Brien, Fowler & McDougall supplied the cement necessary for this concrete work to the subcontractors at a rate of $3.00 per barrel. This cement cost the general contractors $1.10 per barrel at Fort William and with the addition of freight charges to Graham and an allowance for handling, the cost to Messrs. O'Brien, Fowler & McDougall at Graham was $1.75 per barrel, so that in addition to the profits already referred to, the main contractors had a profit on cement of $1.25 per barrel which amounted to $7,500.00 on the whole transaction, and this added to the profits referred to shows Messrs. O'Brien, Fowler & McDougall as being $57,946.19 to the good.

"In order to arrive at the profits which the subcontractors were enabled to make at their prices, I have prepared an estimate of the net cost of each item included in the construction of the building, the prices being based on cost at Fort William with full allowances for freight charges from there to Graham.

"I find that the net cost of this building was $96,202.59 which leaves the subcontractors a profit of $57,263.00, so that of the $203,911.78 which was the cost to the Transcontinental Railway, some $115,209.19 was contractors' profits.

"Attached herewith is the detailed estimate referred to which shows the amount paid to each of the contractors together with the net cost of the building."

"Yours truly,

"THOMAS TOMPKINS."

Mr. Tompkins' report, as regards the large profits made possible by the high prices paid by the Commissioners, is confirmed by the evidence given by Mr. A. McDougall (p. 550).

The Commission have endeavoured in various ways to determine what is a just and fair price for these buildings and what their cost would have been had the contract for their erection been open to ordinary competition.

A further report from Mr. Tompkins, based on the Canadian Pacific Railway Company's standard design which reads as follows:

"November 25th, 1912.

"The Transcontinental Railway
Investigating Commission,
Ottawa, Ont.

"Dear Sir:—

"I beg to acknowledge receipt of plans of the Canadian Pacific Railway Company's standard engine house.

"As requested, I have made a study of these plans and also of a C.P.R. engine house constructed to these plans, and beg to submit the following:—

"This design appears to be complete in every detail and I am well acquainted with it, having constructed similar houses for the Canadian Pacific Railway at various points on their system.

"I have prepared an estimate of the cost of constructing an engine house of this design at each of the divisional points on the Transcontinental Railway, of the same capacity as regards engine accommodation, and boiler and machine equipment as provided for in the program arranged by the Transcontinental Railway Commissioners.

"This cost is based on my personal knowledge and experience in doing this character of work and full allowance has been made for all freight charges, etc., incidental to the construction of this building at isolated points.

"To this cost has been added an item of 15 per cent as a fair and just profit to the contractor and which is generally in excess of what my experience tells me any contractor may expect on work which is obtained in open competition.

"The following would be the total cost of each of the points enumerated, based on the Canadian Pacific Railway Company's design:

Location.	Number of stalls.	Estimated cost.
Moncton	12 stall and machine shop	$ 62,000.00
Napadogan	12 stall and machine shop	62,000.00
Edmundston	12 stall and machine shop	62,000.00
Laurier	12 stall and machine shop	53,000.00
Quebec	12 stall and machine shop	62,000.00
Fitzpatrick	12 stall	53,000.00
Parent	12 stall and machine shop	62,000.00
O'Brien	12 stall	53,000.00
Doucet	12 stall	53,000.00
Cochrane	18 stall and machine shop	76,000.00
Hearst	12 stall	53,000.00
Grant	12 stall and machine shop	62,000.00
Armstrong	12 stall	53,000.00
Graham	12 stall and machine shop	76,000.00
Redditt	12 stall	53,000.00
Transcona	24 stall	96,000.00
		$991,000.00

"I find that these sums mentioned above are over 33 per cent in excess of what these buildings have cost at points on the Canadian Pacific Railway along the north shore of Lake Superior.

"Yours truly,
"THOMAS TOMPKINS."

indicates that by the inclusion of the items for engine houses in the general contracts, without insuring any protection to the country as regards the cost of the buildings, the Transcontinental Railway has become involved in a series of agreements which have increased the cost of these buildings, unnecessarily, about $759,000.00, the greater portion of which is contractors' profits.

Mr. J. M. R. Fairbairn, Assistant Chief Engineer of the Canadian Pacific Railway, has supplied the Commission with a statement showing the cost of these buildings on that railway, and from the figures submitted we find that for a twelve stall engine house with machine shop, which on the Transcontinental Railway costs from $96,000.00 to $110,000.00, the Canadian Pacific Railway have been paying from $49,000.00 to $50,000.00, so that we have no hesitation in accepting the estimated figures in Mr. Tompkins' report as being not only sufficient for the work, but liberal.

At O'Brien, the first divisional point east of Cochrane, the engine house has not yet been erected, and the Grand Trunk Pacific Railway, who hold the contract, No. 14, having released the Commissioners from this feature of their contract, tenders for the construction of a twelve stall engine house were advertised for on March 22, of last year. The lump sum tenders received and the amount at which the contract has been awarded, namely, $59,189.44, is about 30 per cent less than the estimated cost of this structure under the original schedule of prices for this work, and illustrates most forcibly the serious losses which result from the handling of contract work of this character by inexperienced officials.

Coaling Plants.

The following list shows the location, design and contract price of the coaling plants, either complete or in the course of erection:

Transcona	1,000 ton coaling trestle	$26,814.00
Reddit	1,000 ton coaling trestle	27,000.00
Graham	1,000 ton coaling trestle	27,000.00
Armstrong	200 ton mechanical plant with sand house	18,300.00
Grant	200 ton mechanical plant with sand house	17,959.00
Hearst	200 ton mechanical plant with sand house	17,927.00
Cochrane	1,000 ton coaling station with sand house	28,400.00
Edmundston	200 ton mechanical plant with sand house	18,347.00
Napadogan	200 ton mechanical plant with sand house	18,365.00
Moncton	200 ton mechanical plant with sand house	18,335.00
		$217,647.00

The other divisional points, Laurier, Quebec, Fitzpatrick, Parent and Doucet, when complete will be provided with coaling plants.

Trainmen's rest houses, or what are more familiarly known to the railway employees as bunk houses, have been contracted for at the following points at the various rates shown:

Napadogan	$ 9,400.00
Edmundston	12,990.00
Monk	8,220.00
St. Foye	7,550.00
Fitzpatrick	7,875.00
Parent	6,096.00
Cochrane	11,290.00
Hearst	11,800.00
Grant	11,040.00
Armstrong	11,040.00
Graham	11,290.00
Reddit	11,290.00
Transcona	11,290.00
	$130,671.00

The Grand Trunk Pacific design for this structure shows a two-storey building with a deep basement extending the entire length and width of the building.

Without going into the detail of design or construction of the other buildings coming under the head of "Terminal structures" the Commission are desirous of pointing out the serious increase in cost of these items on the Transcontinental, as compared with the Canadian Pacific Railway.

In order to arrive at a fair comparison, the Commission requested Mr. J. M. R. Fairbairn, Assistant Chief Engineer of the Canadian Pacific Railway, to supply them with details and cost of the terminal and other buildings erected at the divisional point at Muskoka on the main line of the Canadian Pacific Railway between Toronto and Winnipeg.

Muskoka was selected as representing similar conditions to those which exist on the Transcontinental Railway.

It is a modern railway divisional point on a low grade line (0.3 per cent). It is in an unsettled part of the country, and, in fact from every viewpoint, represents, as nearly as possible, the conditions to be met with at such a divisional point as Reddit on the Transcontinental Railway, between Winnipeg and Superior Junction.

In the following comparison, between the equipment, accommodation and cost at these points, the date and figures in connection with Muskoka are taken from the statement submitted by Mr. Fairbairn, and the information regarding Reddit from the records and contracts of the Transcontinental Railway.

Engine Houses.

Reddit:

This is a 12 stall brick building with boiler room, but no machine shop. Cost $95,000.00.

Muskoka:

Concrete building. 8 stalls with machine shop and boiler room, 47 ft. by 63 ft. Cost $36,000.00.

Store and Oil House.

Reddit:

Concrete and brick building 47 ft. 9 in. by 20 ft. 2 in. with extension oil vault. Cost $7,200.00.

Muskoka:

Concrete and frame building, 30 ft. by 30 ft. Cost $3,500.00.

Coaling Plant.

Reddit:

1,000 ton coaling trestle. Cost $27,000.00.

Muskoka:

Two pocket, 80 ton mechanical coaling plant, with sand house. Cost $8,000.00.

Station Buildings.

Reddit:

One Standard No. 1 Station. 24 ft. by 53 ft., containing on the ground floor, baggage room, 13 ft. 6 in. by 22 ft. 8 in.—ladies' waiting room, 9 ft. by 13 ft.—operation office, 10 ft. 6 in. by 13 ft.—living room, 9 ft. by 13 ft. —kitchen, 10 ft. 6 in. by 13 ft.—and general waiting room, 13 ft. 6 in. by 22 ft. 8 in.—and on the first floor, 3 bedrooms, 10 ft. 6 in. by 13 ft., and 2 bedrooms, 10 ft. 6 in. by 9 ft. 10 in. Cost $5,164.56.

One Station Building, Design D. 30 ft. by 102 ft., containing on the ground floor restaurant and kitchen 28 ft. 6 in. by 40 ft.—general waiting room, 20 ft. by 28 ft. 6 in.—operators' office, 11 ft. 6 in. by 20 ft.—trainmen's room, 14 ft. 6 in. by 16 ft.—ladies' waiting room, 26 ft. by 8 in.—lavatories, 15 ft. by 9 ft.—baggage room, 20 ft. by 28 ft. 6 in.

And on the first floor, office, 26 ft. by 11 ft.—office, 10 ft. by 11 ft.—office, 25 ft. by 11 ft.—office, 10 ft. by 11 ft.—office, 23 ft. by 28 ft.—Office, 12 ft. by 11 ft.—Office, 14 ft. 6 in. by 11 ft.—Office, 21 ft. by 11 ft.—office, 11 ft. by 11 ft. —office, 28 ft. 6 in. by 11 ft.—lavatory, 8 ft. by 11 ft. Cost $22,112.00.

Muskoka:

Station Building. 24 ft. by 87 ft. 6 in., containing on the ground floor, waiting room, 18 ft. by 22 ft. 6 in.—operators' office, 10 ft. by 12 ft. 6 in.—trainmen's room, 10 ft. by 16 ft. 6 in.—living room, 10 ft. 3 in. by 12 ft.—kitchen, 13 ft. 6 in. by 12 ft. 0 in.—baggage, express and freight, 40 ft. by 22 ft., and on the first floor, 3 bedrooms. Cost $5,000.00.

Reddit:

Standard Freight Shed, 23 ft. by 60 ft. Cost $3,038.50.

Muskoka:

Freight room in station.

Ice Houses.

Reddit:

Standard ice house. Cost $3,400.00.

Muskoka:

None except a small building, 10 ft. by 16 ft. in connection with boarding house. Cost $200.00.

A summary of these figures shows the following conditions and costs:

	Reddit.	Muskoka.
Engine house	$95,000.00	$36,000.00
Store and oil house	7,200.00	3,500.00
Coaling plant	27,000.00	8,000.00
Stations (2)	27,376.56	(1) 5,000.00
Freight sheds	3,098.50	nil
Ice house	3,400.00	200.00
	$163,075.06	$52,700.00

These figures in some measure indicate the costly equipment of the Transcontinental Railway in the matter of buildings as compared with the Canadian Pacific Railway.

We have already dealt with the engine houses and have shown that the excessive price paid for these buildings was the result of the method of awarding the contract. At the same time, we wish to point out that it would have been advisable to have reduced the number of stalls in each engine house to be constructed to as few as could properly provide shelter for the number of locomotives required to handle the train service on a new line of railway. The extensions of these engine houses, when required, could then have been carried out under a contract awarded in open competition with the resultant reduction in prices and cost and saved interest in the meantime.

The store and oil house erected is a one-storey building with a deep basement. No stores are carried on the ground floor, the entire basement being used for this purpose. The ground floor is devoted to a delivery counter to hand out the various stores to the employees, the oil pumps and office accommodation for about five men. This arrangement necessitates a separate concrete vault being constructed outside the building to receive the oil tanks, thereby adding largely to the cost of the structure.

In the operation of a store house of this character the fact that every article to be delivered, with the exception of the oil, has to be brought from the basement, is a serious handicap to rapid and economical handling of stores.

The office accommodation is greatly in excess of that provided in similar buildings on the Canadian Pacific Railway.

It will be noted that there are two station buildings at Reddit. The smaller building, which corresponds in design and cost very closely with the station at Muskoka, was erected first, but the design was not in accordance with the Grand Trunk Pacific Railway Company's idea of the requirements at a divisional point like Reddit. The second station building, constructed at a cost of over $22,000.00, is the standard plan supplied by the Grand Trunk Pacific Railway for divisional points on the Transcontinental Railway.

The office accommodation provided on the first floor is sufficient for the staff required to operate a railway district of five hundred miles or more.

The design is an office building and station combined and as such should have been erected only at district headquarters on the Transcontinental Railway, which would mean instead of constructing sixteen of these buildings at a cost of $22,000.00 or over apiece, they should only have been erected about every five hundred miles, or say four, for the entire mileage of the Transcontinental Railway.

At the other divisional points, a station building similar to the small station at Reddit would have sufficed. The saving in this one item alone at the prices given above would have been $204,000.00.

The construction of freight sheds at points like Reddit, situated in an absolutely uninhabited country, with a population restricted to the number of employees on the railway company's pay roll, was, in our opinion, a gross extravagance.

In both designs of station buildings, liberal accommodation is provided for baggage and freight, and we cannot imagine a condition which would justify the erection of a freight shed at these points until some local industry had sprung up or some indication of the necessity for such a building was given.

Owing to the character of the country at Reddit, the freight shed is so placed that only by expensive construction work will it be possible for teams to receive freight from this building. The approach to this building is through a marshy swamp, ten or twelve feet below the level of the freight delivering platform.

As regards the bunk houses which are being erected at an average cost of ten thousand dollars, Mr. Fairbairn advises the Commission that the standard bunk houses of the Canadian Pacific Railway, providing sleeping accommodation for twenty-two men, with dining and reading rooms, office, kitchen and lavatories, is erected by them at a cost of $3,300.00.

Bunk houses of this character would have been sufficient and desirable for those points on the Transcontinental Railway where such accommodation was required, instead of the rather elaborate two-storey structure which the Grand Trunk Pacific Railway Company designed for this service, and had the Canadian Pacific design been followed, the saving to the Commission would have amounted to sixty or seventy thousand dollars.

The foregoing chapter deals with the principal structures with which a railway company is concerned. We feel that in dealing with this subject a comparison with the Canadian Pacific Railway, a transcontinental line whose present equipment, structural or otherwise, is the result of many years' experience is entirely in order. The designs in use on the railway are based on the known requirements for each individual building, and, as such, represent what must be accepted as a standard in railway construction. The indiscriminate erection of buildings on the Transcontinental Railway without closely delving into the

necessity for this work, is due to a lack of intelligent supervision on the part of the Commissioners. The money needlessly expended on unsuitable and unnecessary structures, such as the divisional point stations, bunk houses and freight sheds, we place at $500,000.00, which, together with the $759,000.00 to be paid away in contractors' profits, on the engine houses, forms a total of $1,259,000.00 of the country's money, which might have been saved in the various manners dealt with in the foregoing chapter.

CAP ROUGE VIADUCT.

The Cap Rouge Viaduct which carries the Transcontinental Railway across the valley of that name, is located on the North Side of the River St. Lawrence, some 2.4 miles West of the Quebec Bridge.

This is a steel structure 3336 feet in length and the rail level of the viaduct is 172 feet above the low water level in the Cap Rouge River.

The total cost of the viaduct is as follows:

Substructure (concrete pedestals and abutments)	$454,133.51
Superstructure (steel work)	363,329.22
	$817,462.73

Of this amount $329,429.18 was paid the contractor for the construction of the three pedestals adjacent to the river.

The building of this viaduct was included in Contract No. 9, District "B," and the contract was originally let to Messrs. Hogan and Macdonell on the 15th May, 1906, to be completed on September 1, 1907. On the 15th May, 1906, the contract was assigned to Messrs. M. P. & J. T. Davis.

The concrete prices in this contract do not cover pneumatic caisson excavation but do cover all material useable in such work.

In October, 1906, it having been suggested that the three piers for Cap Rouge viaduct be put down by the pneumatic process, Messrs. M. P. & J. T. Davis by a memorandum dated October 27, 1906, offered to do the work of constructing each pier by the pneumatic process for $47,523.80, each pier to take 42 days to build. The memorandum further stated that they would build these piers on a pile foundation, using ordinary coffer dams for $34,547.20 each, but in this case they stated the piers would each take at least 90 days to build.

The prices were submitted to the engineers, who, for the additional cost, which would be about $40,000.00, favored the adoption of the pneumatic caisson plan. Afterwards Messrs. M. P. & J. T. Davis put in a new bid for this work, which is given below with corresponding prices, where they exist, for which they had contracted to do the work in Contract No. 9:

	New Prices.	Old Prices.
Excavation in pneumatic chamber	.70 in foundation.	.06½ per cub. ft.
Timber in caisson	$100.00	
Iron bolts, nuts and tie rods	.10	
Iron drift bolts	.06	.05 per lb.
Cast iron	.05	.04 per lb.
Spikes	.06	.05 per lb.
Caulking, oakum, as required	.10	
1-2-4 concrete in chamber	.75 1-2-4 concrete	.44 per cub. ft.
1-2 1/2-4 concrete in crib	.55	
1-2-4 concrete in pier	.60 1-2-4 concrete	.44 per cub. ft.

This put the work up to $200,000 more than it was expected to cost, and was objected to by the engineers, but the Chairman of the Commission insisted upon the new prices being accepted and the work being done by the pneumatic caisson process.

Now, why the contractor was given higher prices for the material used in the caissons has not been explained to us, nor do we know of any reason why it should have been given.

These piers had to be sunk about 40 feet, and, in our opinion, the work could have been done as expeditiously by the open caisson method as by the pneumatic caisson, and we can see no reason why the pneumatic caisson was adopted except the usual one of increasing the expense.

Mr. E. F. Powers who has had a great deal of experience in just such work as this on the Atlantic Coast was examined. In his opinion work such as was done here can be performed quite as expeditiously and for less than half the cost by the open caisson as by the pneumatic caisson method (p. 549).

Mr. C. N. Monsarrat, who is an engineer of eminence, and who has control of the building of the Quebec Bridge, says in a report made to the Commission:

> "Having made a close examination of the site and of local conditions, and also of the results of boring tests, as shown on Drawing B-1-32, dated November 10, 1906, I would say that I find no conditions which, in my opinion, would warrant the use of pneumatic caissons for the river piers of this bridge."

Mr. C. N. Monsarrat further at the request of the Commission prepared an alternative design for the construction of these bridge piers, the work to be carried out by the open caisson method, and his estimate of the cost of this work, based on the prices contained in Contract No. 9, shows that at least $250,000.00 has been unwarrantably expended on this structure.

On December 6th, Mr. M. J. Butler, then having before him the offer from the contractor to do the work by pneumatic caisson process for $47,523.80 for each pier, considered that the price was reasonable and decided to accept it. Afterwards when the contractor changed his price to increase the cost by $136,000.00, the engineers abandoned the idea of using pneumatic caissons and Mr. R. F. Uniacke, the Bridge Engineer of the Commission, prepared and recommended design "C" which was for the open caisson work. Mr. Uniacke in his report to this Commission on this subject says, in reference to the design:

> "While we were discussing this we were summoned to the Chairman's office, bringing down the plans to lay before him. Mr. Davis was already with the Chairman. The Chairman refused to consider such a change decided upon by Mr. Butler, impressing on me the fact that time was the most important consideration and the object was to have the Cap Rouge trestle ready by the end of 1907 so as to be able to transport the heaviest structure sections of the Quebec Bridge from Belair station to Cap Rouge for the Quebec Bridge, and instructed that the caisson method be followed."

Now then, it will be noticed that the contractor stated that the piers could be put down in one month by the pneumatic caisson and in 42 days by the open caisson method, and in 90 days for the other, so that the only possible gain that the Commission would make by adopting the more expensive method on the facts which were before them, was the saving of about 50 days' time, because there is no reason why the three piers could not be built concurrently. To make this 50 day saving in time $250,000.00 were spent. The benefits to accrue from this saving in time were lost owing to the fall of the Quebec Bridge.

Mr. Davis in his evidence gives a different story as to how the plans were finally decided upon.

CHAUDIERE CUT.

The present line of the Transcontinental Railway, as constructed, from the Quebec Bridge Company's line on the South side of the St. Lawrence River to St. John Chrysostome, where connection is made with the Intercolonial Railway, is a very expensive bit of railway construction. The main feature being what is known as the Chaudiere Cut,—a cutting over one mile and a quarter in length, 40 feet deep in places, and from which some 300,000 cubic yards of material have been removed.

The adoption and final approval of this location was not accomplished without some dissension on the part of several of the Commissioners' Engineers and on the part of the Grand Trunk Pacific Railway. The following is the sequence of events which led to the final decision on this important matter.

On May 13, 1907, Mr. MacPherson wrote to District Engineer Doucet, stating that Mr. Grant had suggested a change in alignment and grade at this point, and sees no objection to the introduction of a velocity grade. In July of the same year, Mr. Woods, Assistant Chief Engineer of the Grand Trunk Pacific, also wrote to Mr. Lumsden, stating that Mr. Armstrong (Grand Trunk Pacific District Engineer), advocated increasing the gradient, which would reduce the cost of the work to one-third of what was contemplated, and again in July, in a letter to Mr. Lumsden, pointed out that the saving to be effected by the adoption of Armstrong's suggestion would be about $250,000.00, that taking into consideration the 1 per cent grades on the Quebec Bridge crossing the St. Lawrence River, it would be needless to sacrifice the amount named to obtain an 0.4 per cent grade eastbound on the present location, and that the adherence to this latter grade would make a very bad showing for all concerned.

On August 1, 1907, District Engineer Doucet wrote to Mr. Lumsden, advocating the 0.4 per cent line as located, and his estimate of August 5, shows a saving of only $10,306.00 to be made by the adoption of Armstrong's line. The cost of Armstrong's line being increased by the addition of one item of $128,918, for "cost of portion of Quebec Bridge Company's line used," and another item for $120,503 being charges for pusher engine.

Mr. MacPherson wrote Mr. Lumsden on August 7th, criticizing Mr. Doucet's estimate as regards these two items and still advocating a revision in gradient and alignment.

On August 8, Mr. Lumsden made his report to the Commissioners on this matter, and having dealt with the costs of the two lines in question remarks: "I do not care to recommend it (the 0.6 per cent grade line) especially as you some time ago determined not to ask for approval of any more so called pusher grades, other than the two already approved near the Tobique and Lake Pohenagamook as on a former occasion at La Tuque, where a much greater saving could have been effected, the management of the Grand Trunk Pacific Railway themselves objected to it."

On August 8, Mr. Ryan, the Secretary of the Commission, advised Mr. Lumsden that his report had been approved, and on the same date Mr. Lumsden wrote Mr. Woods advising him of the stand he had taken in the matter.

Mr. Woods replied to Mr. Lumsden on August 14th, protesting against his decision in the matter and arraying strong arguments in favor of the cheaper line.

The approval of the Commission having been obtained, the construction of the 0.4 per cent grade line was proceeded with, with the result that this portion of the line, some 3.36 miles in length, cost for grading alone $484,103.33, or over $144,000 per mile.

Chief Engineer Grant's report on this matter, dated October 21, 1912, is as follows:

"F. P. Gutelius, Esq.,
Investigating Commissioner.

"Dear Sir:--

"Answering yours of the 3rd instant with which you hand me plans and profiles of several lines from Quebec Bridge East to St. John Chrysostome Yard, together with correspondence on the subject and asking me to make a study of the plan and profiles and let you have a report on the economies that might have been effected, had the line shown red on the plan been constructed, and give you a comparison with the gradient reduced later to 0.4 per cent in twenty years.

"I have made a study of the plans and profiles and also the correspondence connected with this location and I attach herewith a comparative estimate I have prepared from which you will see that if a 1 per cent grade had been adopted as per line "A" in red on the accompanying plan, this line would be 3.67 miles long or 0.31 miles longer than the present line, 2 miles only of which would be new work, beginning from a point two miles East of Quebec Bridge on the line built by the Quebec Bridge Company. The saving in construction cost that would have been effected would have amounted to $389,000 as compared with the cost of the constructed line shown in black, marked "B" on accompanying plan, which from Station 60—Station 240 is 3.36 miles long, from point to point, included in the comparative estimates. Cost of rail fastenings and track-laying not included in comparative estimates. If you deduct from this the operating expenditures that would be incurred by reason of distance, curvature, rise and fall, which are as per Transcontinental Railway locating value:

.31 miles long at 26,000 per mile.....	$ 8,060.00
107 degrees more curvature at 40.00 per degree.....	4,280.00
71' more rise and fall at 350.00 per foot.....	24,190.00
Total.....	$37,190.00

"The net saving would be $351,810.00.

"As the Quebec Bridge is a 1 per cent grade I have not included the cost of a pusher engine, as I am of opinion that the load that can be hauled over this bridge can be hauled over the alternative line shown in red on the accompanying plan.

"The interest on $351,810.00 at 4 per cent for 20 years would amount to, at simple interest, $281,448.00. This shows that had the red line on plan been adopted, a very large saving in first cost would have been effected and the interest charge would have graded a 0.4 per cent line twenty years later, six of which have already passed.

* * * * * *

"At compound interest the saving would be $770,850.00 in twenty years.

"Yours truly,

"GORDON GRANT,

"Chief Engineer."

The plans referred to in this report will be found on exhibit. (See Exhibit No. 81).

Beyond pointing out that the operating company, the Grand Trunk Pacific Railway, objected strenuously to the line as constructed, no further comments are necessary on this avoidable expenditure of $351,810.00.

COAL CREEK FILL.

The Transcontinental Railway crosses the ravine, through which Coal Creek flows, at a point 45 miles westerly from Moncton. The embankment at this point is 6000 feet long from cutting to cutting and the rail level is some 85 feet above the creek level.

The location of the railway at this point was made by Mr. H. M. Balkam who reported that he had thoroughly exhausted the ground in that vicinity and was forced to take this crossing of the gulley as being the most economical, considering the distance and cost of construction of any alternative line.

The original method suggested for crossing this gulley was to construct a steel viaduct, 1000 feet long, over the deepest portion and to build embankments at either end. The work forms part of contract No. 1, which was awarded to the Grand Trunk Pacific Railway who sub-let the entire work to Messrs. Corbett and Floesch. Mr. Foss, however, being in favor of an embankment at this point, having evidently taken the matter up with Messrs. Corbett and Floesch, wrote to Mr. Guy C. Dunn on January 29, 1908, stating that the contractor would make the fill regardless of overhaul for 30c per cubic yard, and allowing for the construction of a 20 foot concrete arch to provide waterway, shows a saving in favor of the arch and fill of $2,269.15.

After the proposed change in the plans had been discussed at Ottawa, the matter was referred to the Grand Trunk Pacific Railway, who approved the proposal to build an arch and fill the gulley—said approval being contained in Assistant Engineer Woods' letter of March 28, 1910.

Mr. Lumsden, on March 30, 1908, submitted the matter to the Commissioners of the Transcontinental Railway for approval, and Mr. Lumsden was notified of their approval on March 31, 1908. The work proceeded and the records do not show that any further reports were made on this matter until December 3, 1909, when the following report was submitted by District Engineer Foss. The letters from Mr. Wheaton and Mr. Woods, Assistant Chief Engineer of the Grand Trunk Pacific, referred to in Mr. Foss' report, are also reproduced herewith:

"The Commissioners of the Transcontinental Railway,
Office of the District Engineer.
No. 60-A.

"St. John, N.B., December 3, 1909.

"Gordon Grant, Esq.,
Chief Engineer, "N.T.C.R.," Ottawa, Ontario.

"Dear Sir:—

"Re Classification at Coal Creek.

"When the special arrangement was made with Messrs. Corbett and Floesch, through the Grand Trunk Pacific, for the substitution of the solid embankment in place of the steel viaduct, it was supposed by everyone who had been on the ground that the material would be earth of a reasonable character to move and that it would make a stable embankment. In fact, on the brow of the bank on the west side of Coal Creek there was

sand showing, but it turned out that this was only two or three feet in depth over a very small area; and, when the borrow pits were opened, especially on the east side, the material was found to be of a hard pan nature, which, when exposed to the air, and wet with heavy rains, became impossible to hold in heavy embankments, and large quantities of it slufied outside of the slope stakes altogether—it became evident that some charge had to be made to secure more stable material. The only train haul material on the contract was in the gravel hills at the North River ballast pit, 45 miles away, and, of course, it was entirely out of the question to expect contractors to hold up their work until track could be completed for this 45 miles from Moncton, and then to take, probably, a year and a half to haul the necessary material this long distance. The only other alternative was to go down to such depth into the solid rock, as would give a large percentage of rock, to ensure the stability of the bank; for if we had attempted to make this fill by stripping the rock, it would have taken, at least, 20 per cent more material, owing to the much flatter slope at which this material could have been made to stand, and this, together with the fact that it would have largely increased the overhaul, the necessary right of way, clearing, grubbing, and lengthening of the arch under the embankment, it would have run the cost to, at least, $400,000 for this embankment. Of course, the material required to take the place of the viaduct has to be put in by the contractors at 30c per yard, no matter what it may consist of, but on the basis of rock borrow at $1.10, as allowed at other points on the district, the total cost of the fill will not exceed $350,000, and we shall have a first-class embankment, which will neither slide, sluff off, nor wash down. I have withheld any change in the classification until the work should be so nearly completed that I could be absolutely sure that the expense, after allowing rock borrow for the solid rock excavated, would be a good deal less than it would have cost for earth material stripped off the rock.

"Messrs. Corbett & Floesch have carried on this work vigorously, under all the discouraging conditions and last month they asked, through the Grand Trunk Pacific, that they be allowed rock borrow for the solid rock excavated. Mr. Woods of the Grand Trunk Pacific came down personally and looked over the work, and wrote me urging such classification and readjustment of classification on Residencies No. 1 and 2. I herewith enclose copy of his letter. I have, therefore, directed that 159,000 yards loose rock and corresponding overhaul be deducted, and in its place an equal amount of rock borrow be inserted, without overhaul. Mr. Wheaton has, also, readjusted the classification on Residencies No. 1 and 2. I enclose herewith copy of Mr. Wheaton's letter, of which I thoroughly approve.

60-A. "St. John, N.B., December 3, 1909.

"Gordon Grant.

"I consider that Messrs. Corbett & Floesch are fully entitled to this and trust that you will approve of same, and take such steps as will be necessary to have the change confirmed by proper authority.

"Yours very truly,

"C. O. FOSS,
"District Engineer."

Enclosures.

"Moncton, N.B., November 30, 1909.

"C. O. Foss, Esq.,
District Engineer "A,"
St. John, N.B.

"Dear Sir:—

"Since taking over this division, I have been making an examination of the classification, and find that Residencies No. 1 and 2 are much lower in this respect than the other Residencies of this division, while the line of demarkation all over the Division is practically the same throughout, and the material precisely the same. The reason why this classification existed is accounted for, partly by the fact that Cross Sections were not fully worked out, and percentages, only, were returned until the actual quantities were determined, and partly for the fact that previous classifications had been cancelled. As an example: In one case, a stream diversion, in the bottom of a borrow pit at the East end of the 11th Mile, had been returned partly as Common Excavation, and partly as Loose Rock, whereas it had been excavated in the Solid Rock. The borrow was necessary, in order to make the North River fill, and, if the pit had not been sufficiently deepened, three culverts would have been necessary, and extra Right-of-Way bought, from which to obtain the necessary material. The amount thus returned as Solid Rock is 2671 yards, whereas about twice this quantity was actually excavated. I have, however, only returned an amount of Solid Rock to correspond with the necessary width and depth to provide sufficient drainage. I have made a personal examination of all the ground with the Resident Engineers, and have restored the classification to what I consider is proper.

"Residency No. 5 was, I thought, a little low judging from the nature of the cuts and borrow pits; but, on examining Cross Sections and Measurement books, can find that little change is necessary, if any.

"I could not quite finish this investigation, and am not prepared to say just now, but think a small increase may be required in December.

"I also found that on some Residencies no return had been made for grubbing on borrow pits, except where the pits were less than 4 ft. in depth. I have gone into this matter and have returned the greater part of this grubbing in the November Estimate. The balance was not quite fully worked out, but will be returned in the December Estimate.

"Very truly yours,

"L. H. WHEATON,
"Division Engineer No. 1."

"Montreal, P.Q., November 16, 1909.

"C. O. Foss, Esq.,
District Engineer N.T.R.,
St. John, N.B.

"Dear Sir:—

"I recently received a letter from the Corbett & Floesch Company, subcontractors for this company for the work from Moncton westerly for fifty miles, in which they state that they are dissatisfied with the classification as returned on estimates to date, on Residencies No. 1 and 2, and on the work at Coal Creek, Residency No. 5.

"They state, in connection with the latter, that the greater portion of the embankment has been made up of solid rock, taken from borrow pits, located and staked out by your assistants. They further state that when the borrow pit located on the east side was opened, the material proved to be of a soft and slippery nature, impossible to hold in the embankment, and for this reason they were stopped from using this material and ordered to take material for the embankment from further east, which proved to be largely solid rock. On this work of which at least 85 per cent has been completed, there has been estimated one-half the quantity of material moved as loose rock and the remainder at 30c per yard, which is unsatisfactory and they request that I take the matter up with your department for a satisfactory adjustment. Since the receipt of this letter, I have visited their work and have given special attention to the heavy embankment at Coal Creek and find the statement made by our sub-contractors substantially correct.

"Under a special arrangement made by Chief Engineer Lumsden, and approved by this company, an arch culvert and embankment were substituted for a viaduct about a thousand feet in length, as first proposed, with approaching embankments, in which there were about 300,000 cubic yards. The change in plans required additional embankments of about 325,000 yards. In this agreement, the contractors were to be allowed (see Mr. Lumsden's letter of April 1, 1908) schedule price for the arch culvert and earth filling, with an addition of 5c per cubic yard overhaul, regardless of the length of the overhaul, making the total price of common excavation in that embankment, 30c per cubic yard.

"It now appears that but little of this material was considered suitable for the embankment and you were forced to go further east where the material proved to be largely solid rock. It would appear, however, that in any event it would have been found necessary to borrow solid rock, to have built the embankment, had the change not been made and the fact that solid rock entitles them to certain classification for same. I think, therefore, that the complaint of our sub-contractors for this part of the work is well founded. It is not within my province to attempt to dictate as to how work should be classified and returned, but I think you will agree with me that the proper allowance for solid rock borrow has not been allowed on this rock. You have an arrangement with other contractors on your district for rock borrow for heavy embankments, which, seemingly, might be applied to this instance, and with the data in your possession regarding quantities, there ought to be no difficulty in arranging an equitable adjustment.

"With regard to the complaint of our contractors in connection with classification on Residencies No. 1 and 2, I am not so well advised, as to the character of the work as I should wish. If the classification was revised by the Division Engineer, there must be some reason why the classification on Residencies No. 1 and 2 is considerably less than Residencies 3 and 4. My own opinion, based upon what I saw when the work was opened, was that on Residency No. 1 the classification should be lighter than on either 2 to 3. Our District Engineer, who has examined this work more carefully than the writer is very much better prepared to say if, in his judgment, the classification is correct, as returned on Residencies No. 1 and 2. If not, I think that both sub-contractors and ourselves will be willing to abide by the joint decision of yourself and Mr. Bouillon.

"Trusting that these matters may be, by your decision settled satisfactorily to all, I am,

"H. A. WOODS."

As will be noted from these reports, the amount of available common location for the construction of this fill was largely over-estimated and it became necessary to borrow rock to the extent of 205,876 cubic yards to complete the embankment. This rock borrow was approved of by the Grand Trunk Pacific (the contractors for this work) and paid for at the special rate of $1.10 1-4 per cubic yard, this rate being authorized by an order in council, passed on January 13, 1911.

The size of the concrete arch constructed was increased from 20 to 25 feet "in the interest of entire safety" according to Mr. Foss' letter of May 31, 1912.

The total cost of the material borrowed for this fill and the cost of the culvert is as follows:

Borrow, North and South—Station 2306-2361—				
Loose rock	33,439 cu. yds.	@ 55c—	$18,391.45	
Over haul	1,242,025 cu. yds.	@ 1c—	12,420.25	$30,811.60
Ditches, North and South in Fill—				
Loose rock	2,322 cu. yds.	@ 55c—	$ 1,277.10	$ 1,277.10
Special Rock Borrow	205,876 cu. yds.	@ $1.10¼—	$226,978.89	$226,978.89
Common Excavation Special	282,093 cu. yds.	@ 30c—	$ 84,627.90	$ 84,627.90
				$343,695.58

Cost of 25 ft. Concrete Arch—				
Excavation, common	1,424 cu yds.	@ 25c—	$ 373.50	
Excavation, no coffer dams	1,887 cu. yds.	@ $1 —	1,887.00	
Excavation, with coffer dams	1,855 cu. yds.	@ $3 —	5,565.00	
Concrete 1-2-4	759.5 cu. yds.	@ $12—	9,114.00	
Concrete 1-3-6	3,414 cu. yds.	@ $11.50	37,554.00	
Paving	56 cu. yds.	@ $ 3.50	196.00	
			$54,689.50	$ 54,689.50

Total cost $398,385.08

These figures have been supplied by District Engineer Foss.

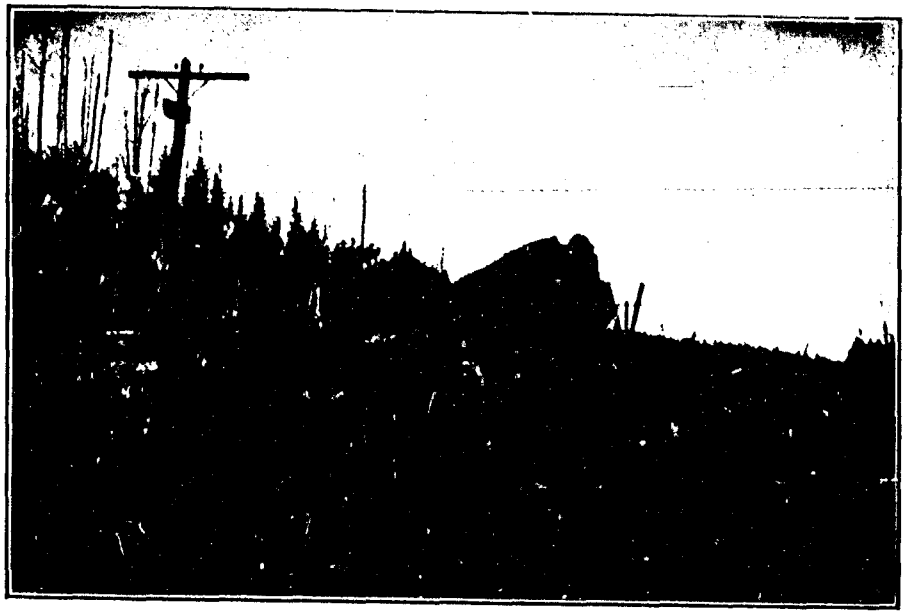
Mr. Uniacke, Bridge Engineer of the Transcontinental Railway, in a letter to the Investigation Commission, states, "the cost of a wooden trestle, covering 2,000 feet of the deepest portion of fill at Coal Creek, is $79,667.58.—The cost of a steel viaduct over this same distance would be $246,110.00."

The actual cost of the fill and structure for this 2,000 feet is $394,385.05, which is a reduction of the value of 8,000 cubic yards of material, which was in excess of the requirements for forming this embankment. That is we have reduced the cost of the fill by the value of the amount of the material which had to be excavated anyway from the cuttings on either side. We find, therefore, that if a wooden trestle had been constructed here, the cost would have been $314,717.50 less than the cost of the fill and arch, and if a steel viaduct had been used, the difference would be $148,275.08.

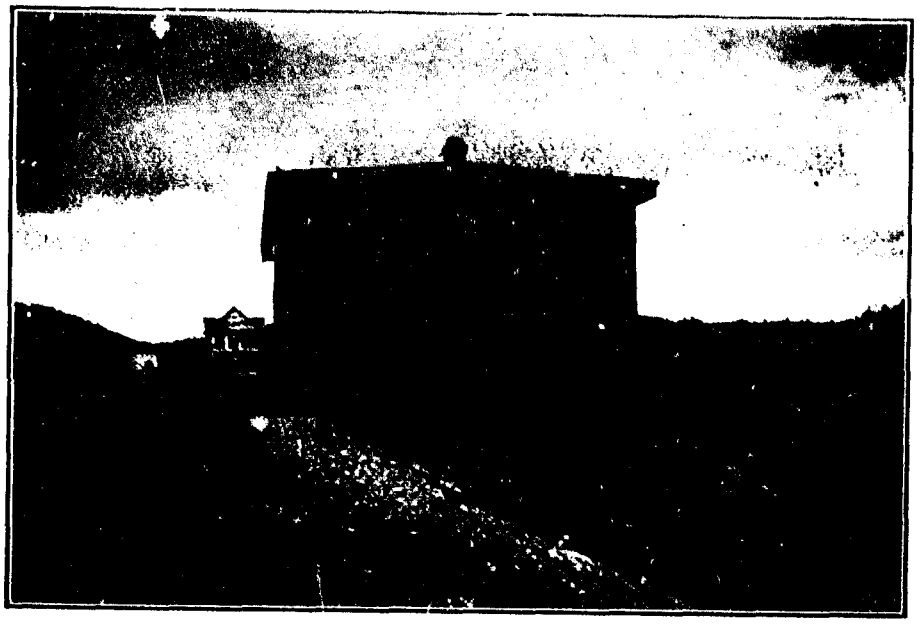
This particular location is included in the statement of wooden trestles, from which will be noted that if a trestle had been built and the permanent work undertaken in 7 years' time (four of which have already passed), the ultimate saving to the country would have been $239,270.00. (See Exhibit No. 22.)

The evidence given by Mr. Foss goes to show that it was on account of the unreliable character of the material when deposited in the fill that it became necessary to resort to rock borrow to complete the embankment, and that when these conditions confronted him, he took the matter up with Ottawa. (P. 97.)

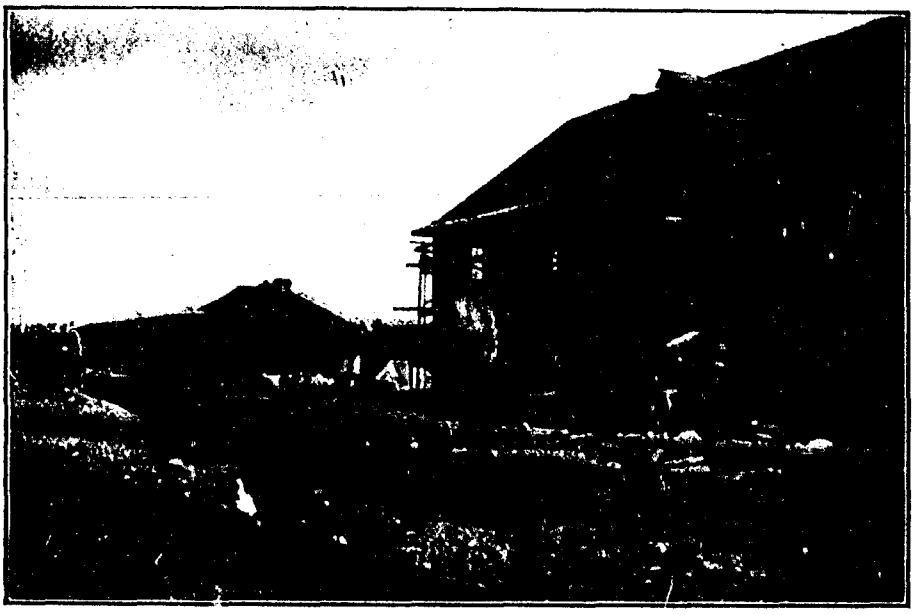
The records however do not show that any report was made to headquarters before a large yardage of rock had been blasted out and used. Mr. Foss' letter of December 3rd was the first intimation received by the Chief Engineer, that the work was being carried on on a more expensive scale than determined on.



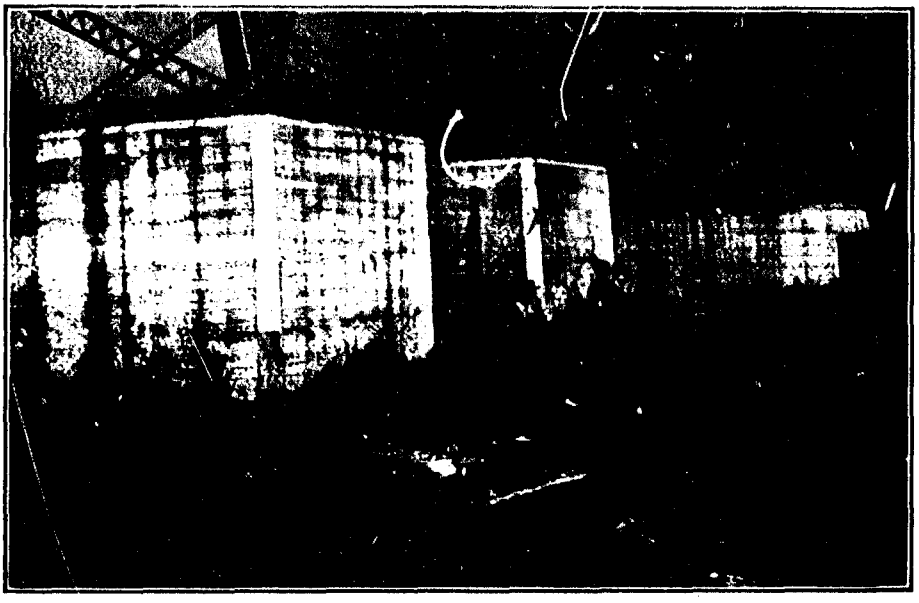
District F, Mileage 8.8, Residency 19. Very Heavy Blasting. Page 70



District F, Reddit Freight Shed Page 86



District F, Reddit. View showing the two Stations. Page 86.



District B, Cap Rouge Viaduct. View showing Concrete Pedestal for River Span. Page 88

The Grand Trunk Pacific officials, occupying, as they did in this case, the dual positions of contractors, and supervisors and inspectors of the work, with a view to economical construction, as provided for in clause 7 of the Act, do not appear to have taken any action, beyond approving of the whole transaction and urging the payment of the rock borrow price. See Mr. Woods' letter of November 30th, 1908.)

The Commission find that if a wooden trestle had been erected here, the saving in seven years would have been $413,853.00, and the ultimate saving when this trestle had been made permanent, $239,270.00, and that this money is lost to the country through the policy which prohibited such methods of construction.

And, furthermore, they feel that when it was discovered that the cost of this fill was to be so largely in excess of the estimate, the local officials should have reported the matter to headquarters, when some means might have been found of overcoming this extra expense, involved by borrowing 205,876 cubic yards of rock at $1.10½ per cubic yard.

CHIPMAN GRADE.

The railway crosses the Salmon River at Chipman, N.B., fifty-seven miles westerly from Moncton, on a bridge sixty-five feet high. This bridge and the embankments forming the approaches to the bridge constitute a crossing of the Salmon River Valley two miles in length. This bridge is at the foot of an 0.4 per cent gradient, seven miles long, rising eagerly from Mileage 57 to Mileage 50, and passing through a cutting two miles long from Mile 52 to Mileage 50 where the summit is attained.

An examination of the engineers and an inspection of the country indicates that the proper location for the line had been secured, but that the 0.4 per cent. gradient did not fit the country, and its adoption necessitated the two mile cutting at the summit and the two mile embankment at the foot of the grade.

District Engineer Foss, at the request of the Commission, has submitted a report showing the saving which might have been made at this lo[illegible] had the locating engineers been permitted to introduce an 0.5 per cent gradient from Chipman to the summit of the hill. This saving is made up as follows:

Saving in construction of bank west of river		**$35,000.00**
47,533 cubic yards solid rock excavation	@ $1.50	71,298.00
76,537 cubic yards loose rock excavation	@ 1.10	84,268.00
26,195 cubic yards common excavation	@ .21	5,500.00
		$150,066.00

To this saving is to be added the cost of the viaduct approach on east side of river, which item Mr. Uniacke will be able to give you readily.

Mr. Uniacke, under date of March 18th, gives the cost of the portion of the viaduct which would be eliminated by the introduction of the 0.5 per cent gradient as $28,158.00 so that the total amount which might have been saved is $178,224.00.

This piece of railway construction is an excellent example of the excessive expenditures occasioned by limiting the locating engineers by hard and fast rules. If they had been permitted to add one-tenth of a foot per hundred feet to the rate of gradient to which their rigid instructions held them, they could have eliminated the two mile cutting containing 150,264 cubic yards of material, and reduced the cost of the Salmon River Bridge by the amount shown.

And we find that in this portion of the line, namely between Quebec and Moncton, with two pusher grades in existence and their use freely advocated by

Mr. Butler on account of the paucity of traffic contemplated by all concerned, the adherence to an actual 0.4 per cent gradient at this and similar locations was quite unjustifiable.

LITTLE SALMON RIVER VIADUCT.

185 miles west of Moncton the National Transcontinental Railway having traversed some rugged country crosses the valley of the Little Salmon River at an elevation of some 200 feet above the water line, and at a point where the valley is over 4,000 feet wide.

The crossing was accomplished by the construction of a steel viaduct 3,920 feet long, containing 13,991,310 pounds of steel and costing, including sub and superstructure, $815,070.87.

The railway construction on either side of this viaduct is of the most costly character, and the very heavy rock cuttings and deep fills in this vicinity might have been greatly reduced and the cost of the viaduct itself entirely eliminated by the adoption of a pusher grade line.

We find that in addition to the 0.4 per cent grade line as constructed, two alternative lines were surveyed in order to find a means of avoiding or reducing to some extent this costly crossing.

One line was projected up the valley of the Little Salmon, crossing that river at a height of about 30 feet over the water line and returning on the west side of the river to the present line. This line, however, proved to be about 6½ miles longer than the viaduct line and its construction would have cost as much or more, so that it was abandoned as an alternative. The second line projected was a pusher grade line using 1.1 per cent gradients, which is the same rate as used for the other pusher grades in this portion of the railway.

In connection with the proposition to construct pusher grades at this location and the saving to be effected thereby, we quote, here, extract from evidence given by District Engineer Foss on this subject:—

> Q. In your evidence, in June last, you stated that if a jack-knife pusher grade had been constructed across the Little Salmon River valley, that something like one and a half million dollars could have been saved. —since that time you have made a further estimate. What are the figures of that estimate?—A. Had a jack-knife pusher grade been adopted at the Little Salmon River, there would have been saved $1,644,882.00, and I think that that would have been somewhat increased if a careful pusher had been worked out and located.
>
> Q. You think that a still larger saving than that would have been effected?—A. Yes, probably a saving of one and three-quarter million dollars.
>
> Q. Having in mind the character of the railway, its cost, and the business that could reasonably be expected of it, would you, if left to your own discretion, have constructed this jack-knife pusher grade instead of the big trestle?—A. I would have constructed it anyway, left to my discretion.
>
> Q. Why?—A. Because, calculating the money at four per cent interest, the interest on the money that would have been saved would probably amount to $75,000.00, and that would certainly pay for pushing the heaviest traffic that is likely, ever, to go over the road.

Mr. Foss's evidence is clear on the saving in, and reasons for the pusher grade adoption.

In connection with the Pusher Grade at Lake Pohenagamook, Mr. MacPherson, Asst. to the Chairman, in a letter to Mr. Grant under date of August 12, 1912, writes as follows:

> "Mr. Gutelius's remarks, that a pusher grade of about 1.47 per cent balances a ruling grade of .06 per cent, are, of course indisputable, but my reasons for not suggesting a steeper pusher grade than the 1.1 per cent adopted, were that I considered freight traffic between Moncton and Quebec would be for a long time and perhaps always, so moderate that most, if not all, of the freight trains and the heaviest passenger trains would not require a pusher over it; whereas, had it been evenly balanced with the .06 ruling grade, both comparatively light freight trains and heavy passenger trains would require pushing. Time will tell whether I was wrong in my judgment of the volume of traffic, but I am still of the same opinion in the matter."

The question of constructing these pusher grades was first raised by Mr. Foss in December, 1907, and after the matter had been reported to Ottawa, Mr. MacPherson wrote to the Chief Engineer, under date of January 8, 1908, as follows:

"File No. 2690.

"H. D. Lumsden, Esq.,
"Chief Engineer,
"Ottawa.

Jan. 8th, 1908.

"Dear Sir:—

"I send you herewith copy of estimate made by Ass't District Engineer Foss, and Mr. Dunn's letter transmitting same, proposing another pusher grade about 10 miles long at a point about 30 miles west of the pusher grade near the Tobique River, which has been approved of. You will see by his estimate, which is not in detail, that he claims a saving of $1,146,019 on construction, or a net saving of $650,809, when the cost of operation is considered. There is not sufficient detail in this estimate to check it by, and, as you see, it is based on a trial location. One object of the pusher is to avoid the very large Viaduct over the Salmon River, and, as we have so many large steel structures, it might hasten construction if we could throw out such a large one. One difficulty about changing our line at present is the fact that it is proposed to let contracts soon, and we only have a trial location over this proposed pusher grade.

"Will you kindly have the matter settled and advise what steps should be taken.

"Yours very truly,

"D. MACPHERSON,
"Ass't Chief Engineer.

"P.S.—The pusher grade line is 0.611 miles the longer and the curvature and rise and fall is greater than on the standard grade line."

A search of the Chief Engineer's record, where this letter is on file, does not show that any action was taken on the matter.

Mr. Foes's evidence and Mr. MacPherson's letter indicate the general expectations as regards the volume of traffic between Quebec and Moncton. The arguments which present themselves in connection with this subject are,—

In favour of the air line, involving the immediate construction of the viaduct,—

1. This line is on a 0.4 per cent grade.

In favor of the 1.1 per cent pusher grade lines,—

1. An immediate saving of $1,750,000.00.

2. A railway constructed to these grades will be as efficient as the 0.4 per cent grade line to handle the business for years and years to come.

3. By constructing the pusher grade line, the Commission would have saved in ten years' time in interest above $25,000.00 more than the entire cost of the viaduct, the exact figures being $840,000.00.

4. In twenty years' time, the original saving, with interest, would have amounted to $3,832,500.00, which would have been sufficient to rebuild the line to suit any volume of traffic and still leave an ultimate saving of $1,300,000.00.

In view of these facts, the Commission concludes that this extra expenditure of $1,750,000.00 was ill-advised and made without due regard to the interests of the country.

LA TUQUE PUSHER GRADE.

Fitzpatrick Divisional Yard, which was once known as La Tuque Yard, is the first engine terminal west of Quebec, and is 126 miles distant from the north abutment of the Quebec Bridge. Approaching this yard from the East, commencing at about mileage 115, the railway drops on an 0.4 per cent compensated grade to the yard level at mileage 126, through a very rugged and mountainous country. The curvature on this portion of the line is almost continuous, the maximum curve of 6 degrees having been used liberally, and despite this, the cuttings encountered are very heavy, particularly in the vicinity of the Little Bostonnais River.

The locating engineers projected an alternative line for this location, which involved 4.8 miles of a .65 per cent grade, adverse to east-bound traffic, to be operated as a "pusher grade" and in June, 1906, District Engineer Doucet wrote to the Chief Engineer, advocating the adoption of the pusher grade line and showing a saving in its favor of $485,807.00, after taking into consideration both construction and operating costs (p. 366).

Mr. Lumsden, on June 15, submitted the proposition to the Commissioners, recommending that approval be obtained from the Government for the construction of the road with the pusher grade, as suggested by District Engineer Doucet. A "pusher grade" is one over which it is necessary to help a fully loaded train with an extra engine.

The Commissioners submitted the proposition to the Government with all the correspondence, showing the saving and how it was to be made, who in turn referred it to Mr. M. J. Butler the then Deputy Minister of Railways and Canals. That gentleman advised the Government not to approve of the pusher grade "for the reason that it has been stated over and over again by members of the Government that a four-tenths grade had been secured from Winnipeg to Quebec, and it seems to me that no circumstances should be permitted to interfere with the adoption of this grade between the points named." This appears to have been such an unanswerable argument that the Government, while appreciating the fact that no advantage whatever was to be derived from it, insisted on a four-tenths grade, thereby incurring unnecessary expenditure of over a million dollars. The Commission also submitted all the facts to Mr. Hayes,

President of the Grand Trunk Pacific Railway Company, who, while admitting that the reasons given "are all practical reasons which may be very properly advanced for the adoption of the pusher grade," went on to say "In my opinion, however, the Commission should carefully consider with the Government the effect upon the minds of the public regarding this Transcontinental Railway, which has been widely advertised as being the only low grade line from the Atlantic to the Pacific." It will be seen that neither Mr. Butler nor Mr. Hayes, the one an engineer and the other an operator of railways, offer any reason why, from a commercial point of view, this million dollars should not have been saved.

Mr. Doucet furnished this Commission with a comparative estimate between the actual cost of the line as constructed, mile 115-122.7 "B" and proposed 0.65 pusher grade line "C" at La Tuque, which is:

Actual cost of line as constructed, mile 115-122.7		$1,345,251.00
Actual cost of Divisional Yard constructed		569,273.00
Total		$1,914,524.00
Estimated cost of 0.65 Pusher Grade Line	$641,235.00	
Estimated cost of Divisional Yard on Upper Level	210,859.00	
Total	$852,094.00	
Increased cost by adoption of present line		$1,062,430.00

Mr. Doucet gives the following as the history of this piece of construction (p. 365): "On making the final survey of the line at La Tuque, we found that by the actual levels we could not possibly get down to the level of the La Tuque Flats, using a 4.1 grade, and unless we took a very roundabout way, increasing the length of the line some three miles, and at a very excessive cost. The use of a direct 4.10 grade also prevented us from using the Flats at La Tuque for a Divisional Point. We found that a direct line could be held by starting at Creek Beauce to the La Tuque Flats, using a 0.65 grade. I had the engineers look very carefully over the ground and run a number of lines to prove that it would be in the interests of the Commissioners to use this direct line. This 0.65 grade line could not be considered altogether as a Pusher Grade. It was much shorter, had less curvature, and would cost much less to build than the 4.10 grade. It would also have enabled us to use the Flats at La Tuque for a Divisional Yard, whereas by the adoption of the direct 4.10 grade, we were forced to move their yards two miles further to the west at what I might call an excessive cost. By adopting the 0.65 grade we would have saved $300,000.00 on the construction of the yard alone."

It was not pretended by any person that an advantage would be gained either in construction or operation by adhering to the 0.4 per cent grade at this place.

Although Mr. Doucet in his estimate made allowance for the cost of an extra engine to help trains over the grade, in practice such an engine would be supplied at small expense by reason of the grade being near a divisional yard where there are extra engines available. Even the sentimental reason on which the Government based its refusal, and Mr. Hayes, his hesitation to approve that in order not to disappoint the public in its expectation of possessing the only four-tenths Transcontinental Railway, did not exist because as was well known the approach to the Quebec Bridge is over a pusher grade. We find that there was no justification whatever for the expenditure of $1,062,430.

For correspondence in connection with the above see Exhibit No. 30.

LAKE POHENAGAMOOK PUSHER GRADE.

Two pusher grades, that is gradients of such a rate that engines pulling the maximum number of cars which they can haul up the standard rate of gradient require to be assisted or pushed up these steeper gradients, were constructed between Moncton and Quebec.

The one between Mileages 146 and 159 is adverse to eastbound traffic and rises at the rate of 1.10 feet per hundred feet, the other adverse to westbound traffic rises on the same rate of gradient, namely, 1.10 per cent. from Mileage 174 to Mileage 163 (District "B.")

The peculiar condition apparent here is that both pusher grades are of the same rate of gradient, while they should be proportional to the eastbound and westbound grades to which this railway has been constructed, namely, 0.4 per cent and 0.6 per cent, and the rate of the gradient between Mileages 174 and 163 might have been increased to 1.47 per cent., and exactly the same results in operation attained while the construction saving would have amounted to $43,500.00.

This amount is based on an estimate submitted by District Engineer Doucet, who stated in his evidence that had the matter been left to his own judgment and authority, he would have adopted the steeper gradient, and thereby effected this saving. Mr. MacPherson, who, as Assistant Chief Engineer, was directly interested in the gradients and profiles, in a report to Mr. Gordon Grant under date of August 12th, 1912, explains the matter as follows:—

"Mr. Gutelius' remarks that a pusher grade of about 1.47 per cent balances a ruling grade of 0.6 per cent are of course indisputable, but my reasons for not suggesting a steeper grade than the 1.10 per cent adopted were that I considered freight traffic between Moncton and Quebec would be for a long time, and perhaps always, so moderate that most, if not all, of the freight trains and the heaviest passenger trains, would not require a pusher over it; whereas, had it been evenly balanced with the 0.6 ruling grade, both comparatively light freight trains and heavy passenger trains would require pushing. Time will tell whether I was wrong in my judgment of the volume of traffic, but I am still of the same opinion in the matter."

Mr. Tye confirms the Commissioners' opinion that any money expended in obtaining a 1.1 per cent gradient where a steeper grade was permissible was wasted, and, though the amount shown as having been unnecessarily expended at this location is based on the profile of the line as constructed, we have no hesitancy in stating that had the locating engineers been properly instructed in this matter, a far greater sum might have been saved.

The conditions outlined in Mr. MacPherson's report as regards the volume of traffic east of Quebec appear to be reasonable and well founded, and this item of $43,500.00 fades to insignificance, when contemplating the millions expended on the 460 miles of railway between Moncton and Quebec in obtaining 0.4 and 0.6 per cent gradients as provision for trains of a length and tonnage unknown in Eastern Canada.

SECOND SIDINGS.

A station track plan was adopted by the National Transcontinental Railway which provides for two side tracks located side by side on the same side of the main track at all stations which are located about seven miles apart. These sidings have a total capacity of 150 cars, or four average length trains, and are located regardless of volume of traffic, local business or the expense, as many of them are located where heavy rock cutting was required, and being outside the grading

required for double track, become an absolute waste unless required for local business. This plan was adhered to as regards the grading of the sidings between Graham and Winnipeg, and at some of the points in Quebec and New Brunswick. Only after the rails were laid upon several of these sidings was it realized that the extra siding was a useless expenditure and the plan eventually abandoned. (See Exhibit No. 24.)

The standard practice in siding construction on new Canadian railways is to build single side tracks in convenient locations at distances of about ten miles apart, and to extend this single siding as required for the volume of traffic and later on to build intermediate similar sidings using them finally as double track.

The practice of building second tracks at stations is only resorted to when the local business at such stations requires such facility for the loading and unloading of cars, or when the operation of the road becomes hampered by the number of trains or *cars to be taken care of* at that point.

A statement has been compiled covering the cost of the building of these extra side tracks, and is attached herewith, from which it will be noted that had the construction of these second siding tracks been postponed until traffic warranted it a total saving of $374,410 would have been effected.

NATIONAL TRANSCONTINENTAL RAILWAY.

Statement showing locations of second sidings and amounts expended thereon.

(Note:—No tracks are laid at points marked thus—x.)

District A.—

Second sidings constructed at Chipman, Cantor x, Sudbury x, McGivney's Junction x, Maple Grove x, Summit x, Longley, Plaster Rock, Grand Falls, Mileage 195.5, Bellefleur, St. Leonards, Quinibis, Green River, Mileages 237.5, 242.5, and 252.0.

Cost of grading	$38,253.00
Cost of rails, fastenings, switches, ties, and track laying	16,927.00
Total cost, District A	$55,180.00

District B.—

West of Quebec Bridge, second sidings constructed at Mileages 5.2, 65.0, 93.0, 85.0, and 154.5.

Cost of grading	$33,867.00
Cost of rails, fastenings, switches, ties and track laying	17,925.00
	$51,792.00

District C.D.—

One second siding constructed at the west crossing of the Mattagami River, Mileage 134.6.

Cost of grading	$3,962.00
Cost of rails, fastenings, switches, ties and track laying (approx.)	1,500.00
Total cost District C.D.	$5,462.00

District E.—

One second siding constructed at Station 1864.

Cost of grading	$2,584.00
Cost of rails, fastenings, switches, ties and track laying	3,100.00
Total cost, District E	$5,684.00

District F.—

Second sidings constructed at Hudson x, Webster x, Taggart x, Sunstrum x, Hilledge x, Richan x, Freda x, Hunter x, Morgan x, Quibell x, McIntosh x, Canyon x, Flavel x, Jones x, Farlane, Brinka x, Edna x, Minaki x, Wade x, Malachi x, White x, Ophir x, Dott, Brereton, Elma, Hazel x, Vivian, Anola x, Dugald.

Cost of grading	$235,820.00
Cost of rails, fastenings, switches, ties	20,452.00
	$256,272.00

Summary.

District A	$55,180.00
District B	51,792.00
District C.D.	5,462.00
District E	5,684.00
District F	256,272.00
	$374,110.00

HEAVY RAILS IN SIDING.

The commissioners of the Transcontinental Railway have adopted and used steel rails weighing 80 lbs to the yard in all main track sidings, yard tracks, ballast pit tracks, etc. It is the practice on other railways to use second hand rails of lighter weight in unimportant tracks. 65 lb. rails would have been the proper weight for the secondary tracks on the Transcoutinental Railway, the main track rails being 80 lbs.

There are 367 miles of new 80 lb. rails and 947 new 80 lb. turnouts used in the secondary tracks on the Transcontinental Railway. A statement supplied this Commission by Chief Engineer Grant shows that if new 65 lb. rails and turnouts had been used in these secondary tracks and the prices paid per ton were the same as the prices paid for 80 lb. rails, switches, frogs, etc., a saving of $340,500 could have been effected, and if second hand rails (which are usually procurable at a price of $5.00 per ton less than new rails) had been purchased and used as is the usual custom, this saving would have been increased to $520,000.

The responsibility for this avoidable expenditure rests primarily with Chief Engineer Lumsden who wrote the Commissioners, March 25, 1908 (Exhibit 25): "Personally I feel that there is a great advantage in having a uniform rail in use on the entire system but as this proposition will affect the Operators of the road more than the Constructors, the Operating Company should have their suggestion considered." The Grand Trunk Pacific Railway Company in Mr. Woods' letters, March 5th, 1906, states it will be satisfactory to the Grand Trunk Pacific Railway Company if the Commission decide to use 80 lb. rails throughout. The Commissioners in their reply of April 15th, 1908, to Mr. Morse's letter of March 20th, 1908, wherein he states "I write to suggest that it would be well to order light rail for side tracks as it would lessen our capital expenditure," stated "If it now be

desired that a change be made, the Commissioners think that such should be requested by a resolution of your (Grand Trunk Pacific Railway) Board." Nothing further was done by the Grand Trunk Pacific Railway Company, but the new Chief Engineer of the Transcontinental Railway, Mr. Gordon Grant, took the matter up on April 8th, 1910, with Chief Engineer Kelliher of the Grand Trunk Pacific Railway Company and in Mr. Kelliher's reply of April 19th, 1910, he says:—

> "Your suggestion to substitute 60 lb. rails for 80 lb. rails in all yards and sidings for which rails have not been ordered or laid is fully approved by our Vice President and General Manager and myself and I would be glad if you would recommend the adoption of the same to the Commission."

whereupon, Mr. Grant recommended the use of light rails in sidings on April 26th, 1910, and in his recommendation suggested that at that date a saving of at least $150,000 might have been effected. The Commissioners, however, paid no attention to Mr. Grant's recommendation and purchased sufficient 80 lb. rails for all purposes, so that the responsibility for the use of those expensive rails in unimportant tracks subsequent to Mr. Grant's recommendation, rests entirely with the Commissioners.

It should be pointed out that the operating company gains an advantage by having 80 lb. rails in the sidings in that these rails can be exchanged for defective or worn out main track rails, whereas, if the sidings were laid with lighter rails, the operating company would be compelled to purchase new 80 lb. rails for these renewals or replacements at their own expense and cost.

Thus the use of new heavy rails in sidings was equal to loaning the operating company from $340,000.00 to $520,000.00 for rail maintenance without interest for seven years and thereafter at the rate of three per cent per annum, and the saving which the Commissioners might have effected by adopting the lighter rail would have, at the end of seven years, amounted to from $447,000.00 to $683,000.00, according to whether new or second hand rails were purchased.

DOUBLE TRACKING.

At three locations on the Transcontinental Railway the Commissioners undertook the construction of a double track railway at direct variance to the wording of the Act which governed their operations.

At Cap Rouge, or rather between the St. Foye yard, which is the Quebec Freight Terminal, and which lies immediately north of the Quebec Bridge, and the Cap Rouge viaduct, there has been constructed about one and a quarter miles of double track at an additional cost over and above the cost of a single track for this distance of $97,838.02, made up as follows:

Cut Station 81-130.

Extra yardage taken out for double track:—	
S. R., 58,472 cubic yards, at $1.50	$87,708.00
C. E., 2,517 cubic yards at .21	528.57
Extra track material and ballast	9,601.45
	$97,838.02

It will be noted that the cost per mile for this second track is inordinately high, and was caused by the fact that the major part of the work was the excavating for double track of the great cutting immediately east of the Cap Rouge viaduct. S. 81-120 (3-4 mile.)

Prior to the Transcontinental Railway being located at this point, the Canadian Northern Railway, on behalf of the Quebec, New Brunswick and Nova Scotia Railway, had submitted to the Department of Railways and Canals, plans for approval of a proposed line of railway which was to occupy practically the same ground as the Transcontinental Railway does now, from Cap Rouge viaduct to the Quebec Bridge. Authorization for the construction of this line was obtained by the Canadian Northern Railway Company under an order of the Board of Railway Commissioners, dated August 15th, 1904.

Through the energetic action of Mr. Wade, who was Chairman of the Board of Commissioners of the Transcontinental Railway at that date, this order of the Board of Railway Commissioners was cancelled by an order of the Governor General in Council, dated June 28th, 1905, so that at that date the Transcontinental Railway was in a position to proceed with the construction of their single track railway without any interference from other interests.

In August, 1905, Mr. Parent was appointed Chairman of the Transcontinental Railway, and in September, 1905, Mr. Lumsden issued instructions to build double track from the Quebec Bridge to Cap Rouge viaduct.

Mr. Lumsden, in his evidence (p. 395), states that the double track was constructed with the idea of accommodating the Canadian Northern Railway as well as the Transcontinental. The Commissioners were consulted in the matter, and his instructions were issued with their knowledge.

The points that stand out in connection with this matter are:

The Canadian Northern Railway had their plans covering this location approved first.

The Transcontinental Railway wished to occupy the same ground.

There was room for two tracks, as the construction of the double track proves.

The Commissioners of the Transcontinental Railway built a double track to accommodate the Canadian Northern Railway Company.

There was no necessity for a double track. The Commissioners, before the work started, should have made an arrangement with the Canadian Northern Railway in connection with running rights over the single track, and a further agreement relating to the construction of a second track should the traffic warrant the expenditure (p. 434).

By the construction of the second track, the cost of the railway has been increased by $97,838.00 with no benefit accruing.

STURGEON RIVER BRIDGE.

Mile 119.5, District F.

This structure across the Sturgeon River is located on that stretch of railway between Graham and a point where the Grand Trunk Pacific branch line to Fort William leaves the main line of the Transcontinental Railway. The bridge was constructed to provide for a double track railway at an additional cost of $106,035.00, as outlined in the following letter from Mr. R. F. Uniacke to Mr. Grant under date of October 11th, 1912.

"In reply to your letter of the 5th instant, file 12,188, the cost of construction of the Sturgeon River Bridge, Mile 119.5, District F., for double track over and above the cost of a single track structure was—

Sub-structure	$ 49,557.00
Super-structure	56,478.00
	$106,035.00

"R. F. UNIACKE,
"Bridge Engineer."

Before this work was undertaken the matter was referred to the Grand Trunk Pacific Railway Company, and Mr. B. B. Kelliher, Chief Engineer of the G. T. P. Railway, in his reply to Mr. Uniacke, under date of October 25, 1909, expressed himself as follows:

"I agree with you in preference for a double track single bridge, as per section shown in scheme No. 2 at the present time. I have taken this up with our Vice-President and he is of the opinion that it will be necessary for us to double track the line from Superior Junction to the division yard before many years."

The letter then deals with the question of the number of spans required for the crossing, and concludes as follows:

"As far as the Grand Trunk Pacific is concerned they would like to have a double track bridge built on the original construction, and whether the bridge should be two or three spans, you will be able to determine."

Mr. Gordon Grant, in his report to this Commission, in connection with this bridge, says:

"The reason for this bridge having been constructed for double track is that it was deemed advisable to do so, owing to the fact that this crossing intervenes between Superior Junction and Graham yard, which are about six miles apart, the Grand Trunk Pacific Railway Company maintaining that in the near future traffic between these two points would necessitate a double track and that if the bridge was not built for a double track, it would cost a great deal more money later on than at the time it was first constructed."

We do not agree with Mr. Grant as regards the increased cost of this work if undertaken at a later date after taking into consideration the very high existing contractors' prices and the reasonable rates which would have been paid for concrete, etc., once the railway was in operation, and we find that though this unauthorized expenditure was made with the concurrence of the operating company, it was a needless extravagance by which the country is again the sufferer, not only by being mulcted of the first cost involved, namely, $106,035.00, but by losing forever the interest on this amount for at least seven years.

TRANSCONA TO WINNIPEG.

The subject of the location of the Transcontinental Railway entering the City of Winnipeg has already been dealt with. This line from Transcona to Winnipeg, a distance of about 4.9 miles, has been constructed as a double track railway at an additional cost over and above what a single track would have cost, of $475,819.00, made up as follows:

Bridges—		
	Sub-structure	$121,186.00
	Super-structure	224,633.00
		$365,819.00
Grading—		
	Approximate	100,000.00
		$475,819.00

We cannot find any similar instance of a new railway undertaking to provide for possible future traffic in such a manner.

That the Commissioners of the Transcontinental Railway should undertake to double track any portion of the railway seems to be in direct contravention of the terms of the Act and was a most unwise procedure.

In this case the country suffers to the extent of nearly half a million dollars, while the interest on this amount for the period of seven years is also lost.

It was so obviously to the advantage of the Commissioners as representing the financiers of the railway to curtail such inroads on their capital until the traffic conditions should warrant the expenditure that we can only attribute this unnecessary outlay to a lack of interest in the economical and efficient construction of the railway.

TWO PRICES PAID FOR ONE HANDLING OF MATERIAL.

Instances have occurred on the Transcontinental Railway where the contractors have been paid for excavating material from line cuttings and also paid for the same material as train hauled filling, under Item 74C.

These instances are at locations where the material excavated from the cuttings is not required for the construction of embankments in the immediate vicinity, or rather within a distance which would allow the material to be hauled there without paying the contractor an extra under his overhaul allowance clause which would make the cost of the material to the Commissioners in excess of the contractor's price for train hauled filling.

The argument used to justify this double payment is, that owing to the long haul from the cutting to the point where this material would be required, under ordinary conditions, it would be more economical to waste the material excavated from the cutting by throwing it in the spoil bank and to borrow train fill for the construction of the distant embankment, rather than to pay the contractor one cent a cubic yard for every one hundred feet over five hundred feet the material would be hauled from the cutting to the embankment, and that in paying the contractor for excavating the material and then paying him train hauled filling for putting it in the embankment, the Commissioners are not called upon to pay anything in excess of what this work would cost under any conditions.

It is pointed out, however, that by using temporary grades to surmount these cuttings or by slightly detouring the line and providing for these changes in the original profiles given to the contractors, the material in the cuttings for which a double price was paid might have been removed as train fill, classified, if necessary, and one price only have been paid.

We do not find that the Commission or their engineers took advantage of this economy which is the usual practice in construction on other railways, and we find that their omission to do so involved a waste of approximately $75,284.83.

Statement showing yardage and cost of material excavated from line cuttings and paid for at excavation prices, and also paid for at train fill prices.

		Amount Wasted.
Contract No. 2.		
51,242 cubic yards S.R. @ $1.50	$76,863.00	
87,496 cubic yards L.R. @ .50	43,748.00	
37,863 cubic yards Com. Ex. @ .21	7,142.73	
	$127,753.73	
176,601 cubic yards train fill @ 38c	67,608.38	
	$194,862.11	
If paid for as classified train fill would cost	163,584.40	
	$31,277.71	$31,277.71
Contract No. 3.		
3,417 cubic yards loose R. @ 44c	$1,503.48	
2,593 cubic yards Com. Ex. @ 29c	751.97	
	$2,255.45	
6,010 cubic yards train fill @ 50c	3,005.00	
	$5,260.45	
If paid for as classified train fill would cost	3,517.55	
	$2,102.90	$ 2,102.90
Contract No. 4.		
24,302 cubic yards S.R. @ $1.45	$35,237.90	
11,445 cubic yards L.R. @ .45	5,150.25	
7,029 cubic yards Com. Ex. @ .27	1,897.83	
	$42,285.98	
42,776 cubic yards train fill @ 50c	21,388.00	
	$63,673.98	
If paid for as classified train fill would cost	48,549.76	
	$15,124.22	$15,124.22
Contract No. 6.		
75,920 cu. yds. com. ex. @ 23c	$17,461.60	
75,920 cu. yds train fill @ 40c	30,368.00	
	47,829.60	
If paid for as train fill would cost	30,368.00	
	$17,461.60	$17,461.60
Contract No. 8.		
6,500 cu. yds. loose rock @ 65c	$4,225.00	
5,500 cu. yds. com. ex. @ 27c	1,485.00	
	$5,710.00	
12,000 cu. yds. train fill @ 45c	5,400.00	
	$11,110.00	
If paid for as classified train fill would cost	7,870.00	
	$3,240.00	$3,240.00
Contract No. 16.		
16,000 cu. yds. com. ex. @ 38c	$6,080.00	
16,000 cu. yds. train fill @ 55c	8,800.00	
	$14,880.00	
If paid for as train fill would cost	8,800.00	
	$6,080.00	$6,080.00
Total amount wasted		$75,284.83