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21292. Having gone over these accounts at the end of the first season, could you say, even in round numbers, what was the amount of expenditure incurred during that year of 1871 by the Moberly party?—No, I could not. I examined the accounts item by item as vouchers. These vouchers were sent to Ottawa, and Mr. Watt, the accountant, went home with them, and I never knew what the totals were. I simply knew them in detail, and a great many of the accounts came in long after. In 1873 accounts came in for the survey of 1871, and these I certified if they were correct, and sent them on to Ottawa, and the ledger was kept here, I have no idea of what the amount was.

McLennan's party.

21293. Do you remember any other feature of the first year's operations which took place before you went to British Columbia, but which were shown in some of their bearings at all events by the accounts?—Yes; there was a Mr. McLennan had two parties under him. With one of those parties he went up the North Thompson River to Tête Jaune Cache to examine the country there. Another party was instructed to go from the mouth of the Quesnelle, on the Fraser, and go up the Fraser by Fort George to Tête Jaune Cache.

21294. Then easterly from Fort George, do you mean?—South-easterly; to follow the Fraser to Tête Jaune Cache and to meet the other party there.

Mahood's party.

21295. That is the Green party—the other party?—That is Mr. Mahood's. The first party I mentioned was Mr. Green's. He went up the North Thompson.

21296. He was detailed in the neighbourhood of Cranberry Lake?—Yes; the other party was Mr. Mahood's. He was instructed to go up the Fraser from the mouth of the Quesnelle to Tête Jaune Cache; but on arriving at the mouth of the Quesnelle, he was advised it was too late in the season and it would be better for him to go overland to Richfield, the principal town in the Cariboo district. From Richfield he went in a generally easterly direction towards Tête Jaune Cache. He found the country very rough. One ridge was something like 9,000 feet high, and covered with snow.

Expedition badly managed and large expense incurred.

21297. Was that in the Cariboo range?—That is in the Cariboo range. There was a very large expenditure incurred on that expedition. It was very badly managed. Mahood had delayed on the road before starting, and got into difficulties on account of the climate. He lost a great number of mules and horses, and the packers had large claims. He engaged packers, and the packers presented large claims for loss of animals and packing. I think between the two parties there was something like between eighty and ninety mules and horses lost—perished.

Of mules and horses something like ninety lost between the two parties.

21298. Do you mean between Green's and Mahood's parties?—Yes; the Mahood party wintered on the Fraser River at Castle River, a few miles below Tête Jaune Cache. The Green party wintered at the Lake. There was very little feed for the animals, and I think they lost between eighty and ninety horses and mules that winter.

Mismanagement chief in the delay in starting.

21299. Do you know whether that loss was to be attributed to bad management: did you find that from the accounts?—There was bad management, and I reported that to Mr. Fleming, partly in consequence of the lateness in starting. The country was unknown, and perhaps they did not expect the climate would be so rigorous. The larger part

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of the loss was from the rigour of the climate; there is no doubt of that. There was some mismanagement in delay in starting.

21300. Then, do you not think that fair ordinary precaution would have prevented a good part of the expenditure?—Not if they were obliged to leave so late in the season as they did—in September. I think it was far too late. If they had known more of the country I do not think they would have done so, but the surveys were pushed with great haste immediately after the confederation of British Columbia.

Some of the surveys useless owing to inefficiency of those employed.

21301. Is there any other matter connected with that first season's operations which was disclosed to you by the state of the accounts, or by the reports to you from the persons connected with them?—There is some part of the Lower Fraser survey, from Yale to Lytton, and from Lytton to Shuswap Lake on the North Thompson, that the parties employed had not the necessary experience. The surveys were not worth much, but the expenditure was not large. Parties in British Columbia had no experience of engineering—railway engineering; they were put on the parties and the surveys had to be done over again afterwards.

21302. Is there any other matter connected with that first season's operations which was disclosed by that investigation of yours?—I think those are the main points that account for the large expenditure; a large number of animals was lost in Mr. Moberley's party, and provisions too, that were too expensive to go and bring afterwards.

21303. I think, upon a former occasion, you gave us the particulars of your operations in British Columbia between 1872 and 1873, or was there any portion of 1873 not finished?—I think so. They are very fully given in the report of 1874. An account of the operations in 1872 was given in the report of 1874, page 105 to 156.

21304. That report was made for the public, I suppose?—Yes.

The fire which took place in offices in 1874, another cause of expenditure.

21305. But sometimes things occur which are not considered desirable to mention to the public—I am speaking of these: are there any other matters connected with that year's operations which bear on the subject we are examining?—Nothing of special interest. Of course I had very frequent communications with Mr. Fleming. Everything was discussed and every effort was made to reduce the expenses and to do the work as economically as possible. Frequent confidential communications took place between Mr. Fleming and myself, both verbally and by letter. I may state that another cause of increasing and increased expenditure afterwards was the fire that took place in the offices here.

This fire destroyed all the work of 1872.

21306. At Ottawa?—At Ottawa. That was in the spring of 1874, I think. That burned up all the papers in the office—destroyed, I think, the whole work that was done in 1872. It was burned up except one plan, and subsequently had to be re-surveyed.

21307. After your operations in 1873 in British Columbia, did you come directly to Ottawa?—Yes; I came home to Ottawa. I left Victoria on the 12th of December, 1873, and returned to Ottawa.

21308. And after your arrival here, how were you occupied in connection with this railway?—Superintending the making of the plans during the winter.

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Left Ottawa 15th May, 1874, with three parties, and several exploratory examinations were made.

21309. Until about what time?—I left Ottawa on the 15th of May, 1874, taking three parties with me. You will find in the report of 1874 that there were several examinations of the country made in the manner that I had suggested in my first letter to Mr. Fleming; some in the neighbourhood of Blue River and Clearwater, and also there was an examination made from Fort George up the north branch of the Fraser and across the Rocky Mountains, by two engineers—Mr. Jarvis and one assistant—and a few Indians.

21310. You had charge of the operations in British Columbia in 1874?—Yes.

21311. You were there?—Yes; I was there that season.

21312. Were the examinations principally by the help of instruments, or in the shape of explorations?—The first operations in 1874 were examinations from the valley of the North Thompson up to Clearwater River, and thence north-westward towards Lake la Hache; and another examination up the Clearwater River to Lake Clearwater, and along the side of the same, thence easterly across a part of the Cariboo range into the valley of the North Thompson; at the last part being very nearly the same line that Mr. Moberly had partly examined in 1873. These examinations showed that no feasible line could be obtained in that neighbourhood; consequently the parties went on up the North Thompson River and Albreda, until they arrived at Tête Jaune Cache. Then they made an instrumental survey down the Fraser Valley from Tête Jaune Cache to Fort George.

21313. Why an instrumental survey?—It was the only line left from the Yellow Head Pass that was feasible then. It was the only feasible line left going towards Bute Inlet, the others having been proved impracticable.

Bute Inlet one of the probable termini.

21314. Then had Bute Inlet been adopted as one of the probable termini on the Pacific?—Yes; one of the probable termini. You will find in my instructions of the first year, 1872, my special work was the survey from Bute Inlet up to Tête Jaune Cache. While these instrumental surveys were being made, I chartered a steamer and went

Coast examined.

along the coast examining numerous inlets from Burrard Inlet northward as far as Port Simpson, at the same time Mr. Horetzky was employed making examinations of two of those passes, one from Gardner Inlet eastward across the Cascade Mountains, the other from Dean Inlet eastward.

21315. These Horetzky examinations were simple explorations I understand?—Yes; simple explorations. After I returned from the coast examination, I went and examined a large part of the southern part of British Columbia, from Fort Hope, I think it was in that year. My exploration from Fort Hope is described in the report of 1877, pages 115 to 118. After that I continued with my simple exploring out on the route to the mouth of the Quesnelle.

21316. From what point did you start with that exploring party?—I started from where I left off the last exploration. The first exploration was to the south-east by Similkameen and the Okanagan Lake, and back of Kamloops and Lake Nicola by the Cariboo waggon road, near Lytton. From that point I followed the waggon road up to the mouth of the Quesnelle, and across the river there, and made an exploration northwards parallel to the coast on the inner flank of the Cascade Mountains, as far as Lake François—about the 54th parallel. From

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that I went to Fort Fraser and down the Nechaco River to Fort George. There I met the instrumental parties.

21317. Under the charge of Mr. Jarvis?—Under the charge of Mr. Jarvis. Mr. Jarvis's party had come down the Fraser. There was another party under Mr. Bell that I employed from Fort George south-westward up the Chilaco Valley towards Bute Inlet—on the line towards Bute Inlet.

21318. Was Mr. Horetzky under your charge that season?—Yes; all the parties were under my charge while I was in British Columbia.

21319. You heard him give some evidence concerning one of those explorations, did you not?—Yes; a very small part of it. I think he was giving his evidence about an inlet that I saw there, the Kitimat River. I was at that point and saw the pass that he mentioned, but it was going northward towards the Skeena River, and I saw in a direct line eastward from the Kitimat.

A good pass from Douglas Channel through Kitimat Valley to the Skeena River.

21320. I think he said that he had come to the conclusion that there was a pass from the Douglas Channel up through the Kitimat Valley to the Skeena River; he had not actually traversed it, but he believed there was one: do you say you were through that pass?—I was not through it, but I saw it from the head of the Douglas Channel. There is a broad valley extending as far as the eye can reach from the high hills.

21321. Was it your conclusion that there was a good pass through there?—Yes; there was a good pass through there to the Skeena in that direction. As far as the eye could reach the valley was very broad and level. I mention it in my report. You will find on page 111 I state this:

"The Kitimat Valley at the head of the channel appears to be three to four miles wide and very low. It stretches away to the north affording an easy route to the Skeena River. On the west the hills rise to an altitude of from 1,000 to 3,000 feet covered with the irrepressible fern. On the east side the hills butting on the channel are of a similar character, but through low gaps in the range we got glimpses of higher mountains capped with snow, leaving scarcely a channel of a practicable route for road or railway through the Cascade chain to Lake François or the River Nechaco."

21322. I think that inlet is sometimes called Kitimat Inlet, is it not: it is marked on the map the Douglas Channel?—It is the head of the Douglas Channel.

21323. Then I understand the result of this exploration by Mr. Horetzky, corroborated by your view, to be, that if this Douglas Channel was available for an outlet, it could only be approached from the Skeena River and not direct from the François Lake?—That is my opinion.

21324. Was it considered one of the probabilities at that time that this Douglas Channel might be made available for a port on the Pacific?—That was the object of my exploration, to examine all the channels and survey the most feasible ones.

21325. As a port then, this was considered feasible, was it?—Yes; it is a pretty good harbour there. It might be made a good harbour in the Kitimat River.

21326. Did you ascertain whether the Douglas Channel was, as a rule, frozen in winter?—No, I did not; not at that time. It was found afterwards the Douglas Channel was not examined in winter.

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21327. Do you know whether it is, as a rule, frozen in winter: have you had sufficient information on the subject?—I have not.

21328. Have you information that it is not frozen, as a rule?—No; I have not any information about its position in winter.

21329. Was it adopted as one of the probable outlets or ports without ascertaining that fact?—No; it was not. A channel branched out of it called the Gardner Channel. That was one of the channels to which the surveys were mainly directed.

21330. But that could not be approached from the Skeena River through the Kitimat Pass?—No, it was approached by a different pass.

21331. I understood you to say that this Kitimat Pass was explored with a view to having a port possibly in the Douglas Channel?—I explored all the different inlets with that object, but from my statement, which I have just quoted from the report, that did not appear so feasible on account of no approach being obtainable between it and Lake François.

A port which seemed eligible in the Gardner Inlet and Horetzky was exploring across the mountains with a view to it.

21332. Were those explorations on the land going on to ascertain whether there was a feasible line for a railway without first ascertaining whether there was any port proper to be adopted?—No; the channel was examined first, and there was a port that seemed feasible in the Gardner Inlet, and Mr. Horetzky was making an examination in connection with it across the mountains.

21333. Was it in connection with the Gardner Channel that the Kitimat Pass was examined?—No.

21334. How did it come that the Kitimat Pass was examined, if the port was to be first ascertained to be feasible and the Douglas Channel was not feasible?—The Kitimat Pass was not examined; it was only seen from the hills. I looked up it from the hill at the head of the inlet.

21335. Then there was no land exploration made from Gardner Channel, that being the channel that Mr. Fleming had selected as a feasible point for the harbour: is that called Gardner Inlet in the general description in your Department?—The route is called the—it was not from the head of the channel. It is the Kimano Pass. That is a little elevation that comes into the Gardner Inlet, some twenty miles from the head of it on the north side.

21336. Then I understand you to say, that before these land explorations, that inlet was approved of as affording a sufficient port for railway purposes?—Yes, it was. It was adopted for survey. Several were selected. That one was selected for surveying on account of its position. At that time it was thought to be very desirable to get as straight a route as possible to China and Japan, and that port lies in a very good position for that purpose.

21337. Was it ascertained to be a good port, if a good railway could be got to it?—Soundings were made in the Kimano basin and it seemed to be feasible.

Cooper's report of no value; his knowledge was not first hand, and he was interested, holding land in the neighbourhood of Burrard Inlet.

21338. Have you seen the report of James Cooper on page 307 of the report of 1877?—I may say that I pay very little attention to Capt. Cooper's report. He really knew very little about it, except what he had gathered from the surveys, and he was interested in the Burrard Inlet—he had a land interest, and his report had very little effect. It was not reliable at all.

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21339. Do you know whether the land explorations were carried on with the view of carrying the road to particular points on the coast without first ascertaining whether those points could be used as ports? —No; they were carried on simultaneously. In 1874, I examined the coast, and I also examined the mountains parallel to the coast in the interior, and Mr. Hortezky was examining two passes, one to the Gardner Inlet and one to the Dean Inlet, at the same time that I was making those explorations. From the result of our general explorations a survey was made the following year, and the Dean Inlet seemed to be the most feasible. I may suggest that, after the surveying parties of 1872 came in, on all subsequent surveys my suggestions of examining the country before making instrumental surveys was generally taken. We generally made examinations after the explorations. Mr. Fleming agreed with me at once that that was the best way to do after I had written to him. All subsequent surveys, after 1872, were examinations made in advance of the instrumental surveys, and from those examinations instrumental surveys were never made at all when we found that they were not worth surveying.

Examination of possible route on land and of possible terminl on the coast carried on simultaneously.

21340. Did you say that more than one instrumental survey was made in 1874—that by Mr. Jarvis?—Yes; Mr. Gamsby had a party; it was on the same route. The instrumental survey of 1874 was made to connect the Yellow Head Pass with Bute Inlet. Mr. Jarvis had the surveys from Tête Jaune Cache down the Fraser, and then there was Mr. Bell had part of the survey and Mr. Gamsby another. There was a complete survey made during that year from Tête Jaune Cache to the head of Homathco Pass, which leads to Bute Inlet.

21341. Sufficiently close to permit of profiles being taken?—Yes; and quantities have been obtained from that survey.

21342. Then have you described that season's operations as you understand?—I think so.

21343. Where did you winter after that season?—I returned to Ottawa again in the fall of 1874.

Returned to Ottawa in fall of 1874.

21344. When did you leave Ottawa again?—I left again in the spring of 1875. I find that I arrived in Victoria on the 13th of May, 1875.

Left Ottawa in spring of 1875.

21345. Was Bute Inlet considered a probable terminus at that time? —It was considered a probable terminus at that time, so that the surveys of that year were nearly all directed to there. There was one survey directed to the Dean Inlet; but the principal surveys of that year in British Columbia were improving the previous surveys and directed to Bute Inlet.

Principal surveys for 1875, improving previous surveys and directed to Bute Inlet.

21346. These surveys were over lines that had been explored before? —Yes, and partly surveyed instrumentally.

21347. So that they were closer examinations than you had made the previous season?—Yes, much closer. In fact the work then lay between, I may say, the Bute Inlet and the Dean Inlet. The Burrard Inlet had been given up almost at that time.

21348. Will you describe, shortly, the operations for that season: I have your report before me, but I wish to get down in evidence an outline of the operations?—I find a very important survey was made that year from the pass across the Cascade Mountains. The first survey was made by the northern pass. The Homathco leads from the head of Bute Inlet into the interior of the country eastward. Some

Surveys of 1875, described.

Surveys, B.C.: 1875.

forty miles up from the head of the inlet it divides into two branches. The survey of 1872 was made up the north branch of the Homathco; in 1875 it was made on the south branch, after an exploration by myself. I went through with some Indians and found it a feasible route, and had an instrumental survey made of it. Then east of that towards Fort George the line was made—deviations were made, and the line generally improved by good instrumental surveys, and a re-survey was made from the Yellow Head Pass down the Fraser to Fort George. The first survey was a rapid survey—a flying survey, as we call it. This was a thorough survey from which quantities could be obtained. Mr. George Keefer had charge of one portion of the survey, Mr. Trutch of another, Mr. Gamsby of another portion, Mr. Cambie of another portion, and Mr. Jennings also. There were a number of parties—in fact the whole survey was made complete that year from Yellow Head Pass down to the head of Bute Inlet.

Survey on the south branch of the Homathco.

Re-survey from the Yellow Head Pass down Fraser to Fort George.

21349. That was the principal object of that year's operations?—Yes.

21350. It had been ascertained by previous examinations that such a route was feasible?—Yes.

21351. And this was for the purpose of examining the quantities necessary to estimate the works if desired?—Yes; necessary to estimate the cost of the works.

21352. Is there anything particular connected with that season's operations which you think necessary to explain now, beyond what your report mentions?—There is nothing special any more than the general fact that the parties were very greatly improved. We had an excellent staff for the first year (1872) that I was out. The best parties for the succeeding year were selected, and the staff was really a very excellent staff. From the end of 1872 up to 1876—coming to the end of 1875—surveys were made with great judgment and as economically as could possibly be done. The parties worked very hard.

From the end of 1872 to 1875 surveys made with great judgment.

21353. Were the operations in British Columbia directed by yourself, or under the directions of the superior officer after 1872?—I had the general direction, but the officer at the head of a party received his instructions from me, and he directed the operations of his own party.

21354. I mean, did you select the locality for the examination; for instance, as you say in the year 1875, the principal object was to get a closer knowledge of this route to Bute Inlet: was that done upon your responsibility, or was it under the directions of the superior officer?—It was on my responsibility, but before starting from Ottawa the whole subject was discussed between Mr. Fleming and myself, and the general course of the work selected; but in British Columbia I had the direction of the whole, and I used all my time in examining the country ahead of the survey parties, and sent them back sketches and instructions as far as I was able. I was responsible for the work.

21355. Were you responsible for the selection of that particular work for that season—I mean the instrumental examination of this previously explored route to Bute Inlet?—I was just saying that that was decided, before I left Ottawa, by the Chief Engineer.

The instrumental examination of the route to Bute Inlet decided on by Fleming before witness left Ottawa.

21356. Did you return to Ottawa that winter?—I may state, besides the line to Bute Inlet, there was a line branching off in the neighbourhood of Fort George to the Dean Inlet. That was also surveyed that year, a good instrumental survey made of it, that is a little further north,

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these being the two objective points for the termini of the railway, of that season.

21357. Then there was very little simple exploration in the season of 1875?—No; most of the explorations had been done in 1874. Most of the simple explorations finished in 1874.

21358. Was it considered that you had discovered enough feasible routes to be examined more closely?—Yes; just so.

21359. Did you say you returned to Ottawa in the winter of 1875-76?—Yes; I returned to Ottawa in the end of 1875, I do not know the exact date. It was about the end of 1875 that I returned to Ottawa. I find that I was still in Victoria the 29th of October; it was about the end of the year, about Christmas, I arrived in Ottawa. Returned to Ottawa Christmas of 1875.

21360. Then, in the following spring, the spring of 1876, what was your occupation?—The first thing I did I went out to the French River to examine the route generally called the Georgian Bay Branch. I started a party to work there, and started a party under Mr. Lumsden to locate that branch from a point on French River to Lake Nipissing, near South River on Lake Nipissing. Railway Location—Georgian Bay Branch. In 1877 started a party under Lumsden to locate that branch.

21361. That was a different route from the one which had been adopted some years before and contracted for by Mr. Foster?—It was a little further north.

21362. Did it commence at the mouth, or further inland?—About twenty miles from the mouth of the river at an Indian reservation.

21363. Why was a point twenty miles up the river selected instead of the mouth of the river?—Because the country is very rough towards the mouth—rock, in fact, with hardly any soil whatever, and the French River has several branches, four or five different branches, and we could not have continued the line westward from a point any lower down the river than that point—Cantin's Bay.

21364. Was it considered that the river might be made navigable from that point to the mouth?—Yes; made navigable with some improvement, but it would have required one or two locks. Survey commenced at Cantin's Bay to which point it was thought the river could be rendered navigable.

21365. So that that branch might be made available for the Georgian Bay traffic by improving these waters between the point you name and the mouth of French River?—Yes.

21366. Had you given up charge of the operations in British Columbia, or how was it that you came to have charge of this portion of the country?—The surveys in British Columbia were continued, and Mr. Cambie was sent out to take my place temporarily. Surveys. Cambie sent out to take witness's place temporarily in British Columbia.

21367. But did you not occupy a different position, in respect to this railway, after the spring of 1876, from what you had occupied before?—There was no difference made in my appointment. I had no official notice that any change had been made in my status in the staff, but as first officer, next to the Chief Engineer, I took charge in his absence.

21368. Whose absence?—Mr. Fleming's.

21369. What absence was that?—He left Ottawa and went to England. He got leave of absence, and he asked me to take charge in his absence, which I did, and it was approved of by the Minister that I should take that charge temporarily. Fleming went to England; witness in charge.

21370. Then, at this time, the spring of 1876, you were acting Chief Engineer, I understand?—Yes.

Surveys.

21371. In addition to your ordinary duties?—Yes; I had the general direction of the whole works on the line, both under construction and survey.

Went westward.

21372. Will you proceed, please, after this examination of French River?—I went westward, north-westward rather. I went up the Wahnapitaepee River, and thence across to the Long Lake, White Fish Lakes and Vermillion River—that is, a general north-west course.

Examined works going on from Fort William westward.

21373. Toward Nipigon?—Yes; towards Lake Superior. I went by canoe up the Wahnapitaepee River and across to Long Lake, to the White Fish Lakes and to the Vermillion River, and down the Vermillion River and Spanish River to Lake Huron. I made a great number of portages in that distance, some seventy I think, and then I took the steamer at a point on Lake Huron, and went up with my party to Thunder Bay on Lake Superior. I examined the works that were going on there then from Fort William westward.

Railway Construction.

Contract No. 13.

21374. The first contract in your course would be contract 13?—Yes.

Found line partly graded.

21375. In what state did you find the work?—It was partly graded. I walked over twenty miles of it. I walked over it from Fort William to the crossing of the River Kaministiquia, I think it is about twenty miles. Portions of that distance were graded, and some portions above that point.

21376. Was the work then understood to end at Sunshine Creek, or was it projected as far as Shebandowan?—I think it was to end at Sunshine Creek; I am not very sure though.

21377. Do you remember that the work, as originally projected, was shortened?—The original contract went to Lake Shebandowan, and then it was shortened by stopping at Sunshine Creek.

Work shortened and deviated north-westerly.

21378. Deviating north-westerly?—Yes; I think at the time I went over it it had been shortened. They had instructions to stop there; but I am not quite sure.

21379. Who were the contractors?—The contractors were Messrs. Sifton, Ward & Co.

21380. Who did you find in charge as engineer?—Mr. Hazlewood. Mr. Hazlewood was in charge as the district engineer.

21381. I suppose you had some consultations with him on the subject of the work?—Yes.

Found work progressing very well.

21382. How did you find the work progressing?—It was progressing very well. There had been some changes made in the location of the line—slight change, deviations.

21383. Did you consider that the line had been well selected?—Yes; it appeared to be very well selected, what I saw of it.

21384. The work was satisfactory, you say?—Yes.

Not satisfied with measurements.

21385. Was there anything about that particular contract that attracted your attention?—No; there was nothing to call my attention. I gave them instructions about the measurements of the works; I do not know whether that was that year or the subsequent year. I did not think the mode of measuring the works was satisfactory, and I gave them other instructions. I am not sure whether that was the succeeding year.

Railway Construction—Contract No. 13.

21386. In what respect was it inexact; do you remember any particular feature about it: was it rock, or loose rock, or earth?—No; it was the mode of keeping the books. You understand that measurements are made monthly to pay contractors on account of their work. These measurements are not so close as the final measurement.

21387. But they are made always to show the total quantity executed up to that time?—Approximate.

21388. But I mean they are not made from what was measured one month up to the next month?—The total quantities are returned up to date.

21389. And the quantity for the month is ascertained by deducting the amount shown by the previous measurement from the last?—Yes.

Found measurements were left to junior assistants.

21390. In these measurements, which you say were not accurate enough, were they made too much in favour of the contractor or too much in favour of the Government?—No; I could not state that. When I say accurate enough I do not know that the measurements were inaccurate; but I found they were being left to minor assistants, and I gave instructions to the engineer in charge to be careful and superintend the re-measurements himself, that he was responsible for them.

21391. Then it was not because you discovered errors in the quantities?—I discovered nothing wrong.

Lax.

21392. But they were a little lax?—They were lax, I think. The subsequent year I gave them little instructions, very close in detail, respecting all the details.

Supplied them with more exact tables.

21393. Did you notice any reason why their measurements were not likely to be correct finally?—There were some portions where the cuttings were on sidling ground, and the tables that they were getting the quantities from, they simply took them from the average height, or the average depth of these cuttings. That does not give the exact quantity if the depths vary very rapidly. I supplied them with tables that were more exact.

21394. Is that difficulty in ascertaining quantities where the ground is rapidly falling?—Rapidly falling each way; rapidly falling lengthways and sideways as well—what we call sidling ground—where one part of the cutting may be two feet at one end of it, and the other would be twenty. The average of that is eleven, but taking the averages from that quantity does not give the quantities. The tables are constructed from the prismoidal formula, which gives exact quantities under any conditions.

Prismoidal tables.

21395. What do they require then for data to apply to these prismoidal tables?—They simply look at the ends of the stations. The stations are 100 feet apart, and they note the height or depth at each end of the 100 feet, and these are marked on the tables, the line of figures on the top of the table horizontally, and the other vertically. Running your finger down to where these meet gives the quantity exactly.

21396. Was the inaccuracy of the tables which were in use in favour of the Government or in favour of the contractor?—It depends. Sometimes they might be one way, sometimes the other. There was nothing intentional to make matters wrong.

Railway Construction—Contract No. 13.

21397. It was not because the tables in use were in favour of the contractor?—No.

21398. The ones that were in use might as well favour the Government as the contractor?—Yes. In fact I think generally in the cuttings they would favour the Government; the table would not give such quantities as those I supplied them with.

The principal change as to measurements was arranging that the engineer in charge should look after them himself.

21399. As to measurements, I understand that the principal change was that you directed the engineer in charge to look after them himself instead of trusting them to subordinates?—That was the principal. Mr. Hazlewood was the engineer of the district, but Mr. McLennan, under Mr. Hazlewood, had charge of the operations.

21400. Of this particular locality?—Yes.

21401. Mr. Hazlewood's district was a more extensive one than Mr. McLennan's?—Mr. Hazlewood's district extended a very considerable distance, and more than one engineer was employed under him at different lengths. Mr. McLennan had a sub-division of Mr. Hazlewood's district.

21402. Was there at that time at that end of the line any more work under construction besides this section 13?—I am not sure whether contract No. 25 was under construction. If it was, it was just about the time it was begun I think. You will find by the date of contract No. 25.

By Mr. Keefer:—

Contract 25 let at this time, but very little work done.

21403. It is dated June, 1876?—The contract was let but there was very little done when I was there.

By the Chairman:—

21404. How did you proceed westward from this point?—I went by canoe over what is generally called the Dawson route.

Railway Location—Contract No. 15.

21405. And where did you strike the present line of railway?—I went to Rat Portage—that is the outlet of Lake of the Woods. They were engaged making the final surveys then for section 15—location surveys.

21406. That was before the contract was let?—Before the contract was let.

21407. Who was in charge of that particular section?—Mr. Carre had charge of that section.

21408. Did you stay long upon that section?—No; Mr. Carre was absent, and one of his assistants, Mr. Fellowes, was on the ground. I examined a few miles of it, the roughest part of that end.

21409. Which end?—The east end, at Rat Portage. I then proceeded to Winnipeg where I met Mr. Carre and Mr. Rowan. Mr. Rowan had charge of the district. His district extended from Rat Portage west to Red River.

21410. Speaking of section 15 alone, at present, Mr. Carre was the engineer who had charge of it?—Mr. Carre had charge of that section.

21411. You did not see him until you arrived at Winnipeg?—Not until I arrived at Winnipeg.

Railway Location—Contract No. 15.

21412. How many miles of section 15 did you traverse at that time?—I did not traverse many. I examined a small portion of it.

Found that the works would be heavy, and asked Carre to improve them, who said it could not be done without making grades steeper.

21413. What was your opinion about the location adopted?—My examination was to get a general knowledge of the character of the line, and after having done that I examined it on the profile with Mr. Carre. I found the works were going to be very heavy, and I asked Mr. Carre if he could not improve the line. He said he could not do so without making the grades steeper than those which he had been instructed to keep to by the instructions of the Chief Engineer to him.

21414. Did you take any steps towards improving the location or otherwise benefitting the work?—I asked him to make a survey of six or seven miles, especially at the west end, where he thought the greatest improvements would be made, and to get the best gradients, natural gradients, that he could—gradients that would give less work. I telegraphed to Ottawa that I had done this, and there would probably be a change in the quantities.

When profile was submitted found that the gradients instead of twenty-six and a-half feet to the mile were about forty feet.

21415. Was that before the contract was let?—Before the contract was let. Mr. Carre went on and made that survey, and it was submitted, I think, to—this was in the autumn of 1876, in October, I think. Mr. Carre made the survey, and in the ensuing spring the profile was submitted, I think, to the Chief Engineer at Ottawa. The gradients, instead of being twenty-six and a-half feet to the mile, rising eastward, were about forty feet.

21416. You have seen the profile of the trial line made by Mr. Carre?—Yes; I saw it then.

21417. Not that fall?—I saw the first line, the line that they had surveyed.

21418. I am asking about the trial line, the grades of which you say reached forty feet per mile?—No; I did not see it there. It took some time to make it.

21419. Did you see it afterwards?—I saw it some time afterwards. The report was these were the gradients, and they were objectionable to the Chief Engineer and no change was made.

21420. Had you ever considered to what extent it would have saved the cost of the line, if the gradients had been forty feet instead of twenty-six and a-half feet to the mile in this particular location?—No. I suppose there was an estimate made. There was a saving, but I do not recollect what it was.

21421. Did you go over the portion of the line now adopted near Cross Lake, or over Cross Lake, at the time that you took this trip?—I did not then; subsequently I did.

21422. But not in 1876?—No; not in 1876.

21423. Was it during 1876, while you were acting engineer, that the terminus of this section 15 was fixed upon?—The western terminus ?

21424. The western terminus?—Yes; I suppose it was. There were tenders asked for and the profile submitted, so it must have been fixed before that. The tenders were called for construction of that line before

Railway Location—Contract No. 15.

Mr. Fleming left, or about that time—before I had anything at all to do with it.

21425. The contract is dated in January, 1877?—Yes; but there were three different sets of tenders called for. The first two were withdrawn. I am speaking of the first—the first advertisement for tenders.

21426. Perhaps this will help you upon the point to which I am now giving my attention—that is the western terminus of section 15: is it not a fact that that was established because section 14 had been previously let, and the east terminus of section 14 had been established?—Yes; the line was run to meet the end of 14.

Terminus of 15 practically established by letting 14.

21427. So it was established, in effect, by the letting of section 14 previously?—Yes; perhaps the exact point might not have been established.

21428. The longitude at all events was?—Yes; it was practically established by the letting of 14.

21429. On this occasion, 1876, when you went over the line did you, in Winnipeg or any place, have any conversation with Mr. Rowan on the subject of the crossing of Cross Lake, and did you consider the point at which it could be best crossed?—I do not recollect exactly.

21430. You are aware that there has been a good deal of discussion about the expenditure at that crossing, both on the west end of section 15 and the east end of section 14—the filling—and I wish to find out now whether you had given your attention to that subject at any time up to the end of 1876?—I did not see it until 1877—until the end of 1877.

Witness was not at Cross Lake in 1876.

21431. But I thought you passed over it on this trip of 1876?—No; I was not at Cross Lake.

21432. I thought you went by Rat Portage?—I went by water by the Dawson route to Winnipeg, and then I went over the western portion of 14.

21433. Then you were only on that portion of section 15 close to Rat Portage during that season?—Yes.

Railway Construction—Contract No. 14.

21434. Then going east from Winnipeg you saw a portion of section 14?—Yes.

21435. How much of it?—From the western end of it. I do not recollect how much. I suppose about twenty miles—about as far as it was constructed at that time.

21436. Do you remember who was engineer in charge of that?—Mr. Thompson.

21437. How did you find the work progressing, and what did you think of the location?—The work was not progressing very rapidly. The engineers complained—the resident engineer, Mr. Thompson, complained of it going on too slowly, and there was one part of it very wet, over a muskeg, called the Julius Muskeg. The location had been approved. I made no remarks about the location, it had been submitted to Mr. Fleming, and the grades laid down and approved by me previous to the time I saw it.

Location not improvable by deviation.

21438. Was it not susceptible of improvement by deviation, or some change in the location under your own eye?—Not as far as I could see.

Railway Construction—Contract No. 14.

I gave some instructions about the embankments. They were making the embankments, I thought, higher than necessary, and I gave instructions to lower the embankment and follow more nearly the undulations of the ground, as the natural gradients were very easy; but I could not judge of the location of the line from merely walking along it, as there was a great deal of brush and it was a flat country.

Instructed them to lower the embankments.

21439. But they were constructing; they were taking out the material from the Julius Muskeg and putting it in the embankment?—Yes.

21440. Did you give any attention to the kind of material that was being used?—There was a good deal of it black soil, almost peat, and it was tolerably firm what they were using.

21441. What time of the year was that?—It was in the fall of 1876; it must have been in October or the end of September.

21442. Do you think it was good material for embankment?—It was not the best, but there was nothing very objectionable to it. It was the only thing they could get at all events for mileage.

21443. Did you give any consideration at that time to the mode of measuring that material, whether it should be in the excavation or in embankment, or whether any change should be made in future contracts over similar ground?—In the specification of the contract it is stated that measurement must be made from the cuttings. It would not be possible to make even an approximate measurement from the embankment, because the embankments sank down in the swamp, in the muskeg, when the weight was put upon it.

Muskeg can only be measured from the excavation.

21444. Was that because the material was very open, subject to be compressed by weight?—The material was open, and the top part of it was, a great deal of it, moss and grass, like a sponge, that sank down very considerably, but that was not allowed to be used, to be put in the bank. That was stripped, and the material that was put in the embankment, that was stripped off first, at least I ordered it to be stripped off, and the better material under it was used. Still when that was put on the natural surface it sunk down. Some of those muskegs will sink down two feet in matted grass like a sponge before you come to the water.

21445. When you came to the natural surface of the ground as distinguished from this moss, did you consider then the material to be fair material to be used for embankment?—It was fair material that they were using when I saw them.

21446. Did it become compressed very much after use—after being put in embankment?—Not very much if they carried out my instructions by taking the mossy part off the top.

Thinks the material authorized to be put in the embankment would not compress much; the difficulty of measuring it would arise from its sinking down.

21447. There has been a good deal of evidence before us to the effect that this material became compressed very much after it was in the embankment, perhaps four-tenths or more?—I do not think that the material that was authorized to be put into embankment would compress much, I think it is more from sinking down.

21448. For both reasons it appears that a great deal more was used to make up the embankments than was expected, for the reason that it sank and became compressed?—I believe the greatest portion was due to subsidence more than compression, but the reason why so much

Railway Construction—Contract No. 14.

more was used than expected was this: that line was located and the levels taken in the winter time when the surface was all hard, whereas it was afterwards found that in some parts of that muskeg you could put a rod down eleven or twelve feet.

21449. Then, in taking out the original quantities, it was not supposed that the embankment would go deeper than what was then the surface?—That is what I mean.

The muskeg should have been sounded.

21450. So that all the embankment that went below that surface, as shown in the winter, was so much in addition to the estimated work?—Yes; the original quantities were very far from being correct. There had been no allowance made for anything of that sort. Those muskegs ought to have been sounded, and allowance made for subsidence.

21451. Could they have been sounded for engineering examination?—Yes.

21452. In what way?—They could have been sounded with an iron bar. The best way is to bore where the muskeg is very deep, but you can sound to a considerable depth with an iron bar—what they call a jumping rod—and get approximate quantities, depths, from that.

Never knew any work in Europe being let without all possible information having been obtained beforehand.

21453. Is that the ordinary way of ascertaining depths of such localities in engineering, or is it something very unusual?—It is altogether usual in England and in Europe at any rate. I never knew any work to be let without every information possible being obtained beforehand. In this country the surveys are much more lax, and there is no care taken to ascertain what works are required beforehand. There is a different mode of measurements. They pay them by the yard here; in England the quantities are ascertained and the contractor puts his prices to them, and he undertakes to build a railway so many miles in length in the same manner that he undertakes to build a house—to do everything that is specified.

21454. Then there is a maximum price fixed by the contract?—Yes; unless there are extra works.

21455. Assuming no change to be made for the contractor, they fix a limit of total cost?—Yes; and I think it is a very good thing, in this way, because it settles all questions about measurements. The measurements made during the progress of the work were simply for the payment of the contractor on account. The ultimate sum is fixed.

Usual to dig test pits, and contractors are invited to examine the ground.

21456. That would involve, of course, the necessity before contracting of very accurate information as to classification of the different kinds of material, not only quantities but classification?—It is usual to dig test pits, and the contractors are invited to examine the ground for themselves, as they are to be responsible for the material. The engineer is not responsible. They get the best information they can, and the contractor is responsible for the material himself, the nature of the ground and everything.

21457. After seeing this locality as you did on section 14, particularly the Julius Muskeg, which has given rise to a great deal of discussion, did you then come to the conclusion that a proper examination had been made in order to ascertain the nature of the material, and the probable quantity to be executed?—It was very evident that a proper examination had not been made.

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21458. Did you give any directions about the method of dealing with this muskeg material, or was it permitted to go on as you supposed the contract required ?—I ordered a better examination to be made, and after that had been done we knew pretty well the depths of the muskeg, and altered the plans with regard to the off-take drains accordingly.

Ordered a better examination to be made, and learning the depth of the muskeg made plans for off-take drains accordingly.

21459. Did you, in that season of 1876, have an examination of this muskeg, or any others ?—In 1876, the examination was not made in my presence.

21460. Was it made under your direction in 1876 ?—It was made subsequently. There may have been some examination made then.

21461. What I mean by my question is this: whether you, after having ascertained, either through your own or your subordinates examination, the depth of the muskeg material, decided on a different course respecting off-take ditches ?—Yes; we changed our plans to suit the better information we had obtained.

21462. Could you describe the principle upon which you made the change ?—We ascertained the depth that the off-take drains would be required, and the proper place to make the off-take drains.

21463. Do you mean that you found that the ground subsided more than was originally expected, and that the off-take ditches that would serve a shallow surface would not serve a deeper one, and you had to make deeper off-take ditches ?—The first examination that was made, it showed afterwards the muskeg to be very deep. Subsequently it was found to drain it, it dried up so much that we did not make the off-take drains—it was not necessary to make the off-take drains so deep as was expected after the first examination had been made. What I mean by the first examination was after the contract had been let—the first thorough examination—these were varied from time to time. The thing came very often before me. The effect of the drainage was closely watched and reported to the engineer, and every attention was paid to keep the work secure, and to keep the quantities as low as possible.

21464. Did you consider, at the time that you were at the Julius Muskeg, whether the material which was being moved was as expensive to the contractor as ordinary material called earth excavation ?—No; it was fully as expensive. A good deal of it was water, the water had soaked in.

Excavation of Julius Muskeg fully as expensive as earth excavation.

21465. Did you think that in moving that material a cubic yard it would cost the contractor as much as moving a yard of ordinary earth to the embankment ?—I think it would; most of it would cost the contractor as much. I am supposing that my instructions were thoroughly carried out, to take off the top part which cost them a good deal and which paid nothing, the top mossy part.

21466. Could you tell, by looking at the embankment, whether the mossy part had been kept out or not ?—Yes; you would see it unless it were buried up.

21467. Did you ever see an embankment made through muskeg, in which this mossy part had been used ?—Yes.

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21468. On the Pacific Railway?—I don't remember on the Pacific Railway, but in the course of my practice I have had to order the discontinuance of material, and had it taken out.

The mossy part of muskeg not, so far as witness knows, put into embankments on the Canadian Pacific Railway.

21469. Do you know, from your own knowledge, whether this mossy material was ever put into embankment on the Pacific Railway?—Not to my knowledge.

21470. But you think that this material, irrespective of the mossy top portion, would cost the contractor as much per yard to move it as ordinary earth?—I think it would. It is pretty solid. It is a good deal the nature of peat, and it is pretty solid, and came out in square chunks.

21471. Then it was kept together by fibres or some other material?—No; there was not so much fibre in it. The fibres were not visible. It was more like marl. The top part of it was fibre, but lower down there was not much fibre visible.

21472. Then, was it nothing but earth and water below?—It is that substance called peat. There is no fibre visible in it.

21473. No woody fibre?—It is all woody fibre, but is not visible much. It was pretty solid what I saw being put in.

21474. Then, I suppose, from what you saw, you never considered it necessary to suggest any change in the specifications, or in the particulars about this material?—In subsequent specifications I suggested changes to meet the difficulties of this mossy ground. I suggested a platform of logs and brush. In the subsequent contracts—I do not know the numbers—intermediate between Lake Superior and Rat Portage, I made out the quantities for these, and I put in a considerable quantity of what we call "logging" across marshes.

Repeats that it is impossible to measure muskeg material in embankment.

21475. When I speak of suggestions, I do not mean so much in the method of making the bank as in the mode of measuring this material. It has been suggested before us that the measuring of this material in excavation, as it is ordinarily done in common earth, is not the proper way, and according to the nature of it it ought only to be measured in embankment?—It is impossible to measure it in embankment. It is measured in the best way that could be done. It was measured according to specification. I do not know whether any reduction should be made.

21476. Then it did not occur to you that, because of its nature, there ought to be any reduction from the ordinary price paid for common earth excavation?—I do not know that we had power to make any reduction.

21477. No; but speaking of future contracts, of tenders and of specifications, did it occur to you that it would be proper to say to the public that this material would not bring as high a price as ordinary material when excavated?—No; it was determined not to use any material that was not fit for embankment. That is the reason I substituted—in future bills of work—I substituted logging to cross swamps and did not allow them to take any out of the side-ditches at all, but to bring the material from a distance, from each end, to go over those logs.

21478. That would be the better way?—Yes.

21479. But assuming that this old way was to be continued, and I suppose there would be places where it may be necessary to be applied?

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—Yes; there may be places where there are long stretches of water and black soil, and nothing else in the country but that.

21480. Then assuming that that is the only material available, I am asking you whether it occurred to you, on account of its nature and quality, that its removal ought not to bring as high a price in future contracts as ordinary earth excavation?—I did not suggest anything of the sort. I do not see how it can be done. It will have to be under agreement with the contractor. The engineer has no power. It might have been put in a specification in the bill of works; a price might be asked for black material—swamp material.

Would suggest no different price for this material.

21481. That is what I am calling your attention to; and I am asking whether, from what you saw on the ground, you thought it would be a good thing for the future for the Government to offer this work as a separate work from earth excavation, and to ask people to tender at a separate price for it, or take any other step so as to cost the country less on account of its compressible quality?—I do not think it would operate satisfactorily to ask two prices for the excavation of earth. They would not be twenty-four hours at work before there would be disputes between the engineer and the contractor, as to whether the stuff came within the specification or not. I think the best way is the way I suggested, to cross the swamps with logging.

Best way to cross swamps with logging.

21482. And where this is used to pay full price, as for earth excavation?—Yes, to pay full price. I may state the reason why I do not think it would cost the contractor less, is that the material is surcharged with water, and the shovelling of this material with water in it would cost quite as much to take it out as solid earth; but, of course, it costs the Government more, for after it is put into the bank the water runs out and it requires to be repeated as the bank subsides and as the material shrinks.

21483. One of the engineers has mentioned here in his evidence that he saw, upon contract 14, some of this material being excavated and moved, and that, after being chopped out with a broad-axe, it was pitched on a barrow with a pronged fork, and the barrow moved to the embankment with a load as high as the man's head; that could not have happened if the material had been ordinary earth?—Some of that is of a very tough nature. It is very tenacious. You could almost take some of it in a lump after being disposed of with the pitchfork.

21484. If it was very heavy a man could not wheel a barrow load of it as high as his head?—There must have been a good deal of the top part of the soil, the mossy part, in such a load.

21485. This may have happened before you were up there?—These things happen before the engineer; it is done very quickly sometimes.

Suggested no improvement in location.

21486. Do you remember whether upon that trip over 14 you suggested any improvements in the location?—No, I did not; no material change. I do not remember any, but if there were they were immaterial changes.

21487. Was Mr. Rowan with you while you were visiting 14?—Yes; I think so.

21488. Did you have any conversation with him as to the nature of this muskeg material and the depth of the muskegs?—Yes, it was discussed very thoroughly with Mr. Rowan, and Mr. Thompson too, the

Railway Construction—Contract No. 14.

division engineer. I know the contractors complained, subsequently, when the claim came up that the first location trial line was on much better ground—that is further north, but this location for construction that was made before I was there and approved by the engineer. The line was considerably shorter and straighter.

21489. Did you find that the located line was a better one than the trial location?—I did not see the trial location. I never went over it. It was a longer line with more curves in it.

21490. I think you said that you understood that the line, as adopted at the time of the contract, was changed?—Yes; it was changed.

21491. For a better line?—It was straightened and shortened.

21492. It was a decided improvement?—In that respect it was an improvement.

21493. Was it not an improvement in some other respect?—Subsequently I learned—at least the contractors insisted, that the previous line was a better line for them—that there was no muskeg in it, it was on a drier ridge—in fact they made a claim. They said this muskeg filling cost them more than the earth on the original line would have done.

21494. As far as the railway itself is concerned, do you consider that this change that was made after the contract a beneficial one?—All changes that shorten the line reduce the expenses both in construction and working, provided that there is nothing against them otherwise.

Returned to Ottawa.

21495. Then, after that examination of 14, what did you do next?—I returned to Ottawa. It was the end of the year then, late in the fall.

While Fleming writing his report of 1877, witness attended to the supervision of the work of the railway generally.

21496. Did you continue to be the acting Engineer-in-Chief from that time forward?—Yes, until Mr. Fleming returned to Ottawa in February, I think, 1877. Of course he assumed the duties of Chief Engineer while he was in Ottawa, but he was chiefly engaged in writing this large report (1877) which I have before me here, and I attended to the supervision of the works.

21497. Were your views subordinate to his still?—Subordinate; yes.

21498. Then did your authority diminish after his return to the country, as you understood it, or did you remain in charge generally?—When Mr. Fleming returned I did not rely entirely on my judgment for changes that were required, or any instructions to be given to the staff under construction—any special instruction—without consulting the Chief Engineer while he was present.

Railway Location—Contracts Nos. 14 and 15.

21499. Do you remember whether you had any conversation with him upon the subject of reducing the gradient, or rather increasing it on section 15: I think you said that you proposed to Mr. Carre to make a new line and that he had found one, but it was not adopted, because Mr. Fleming would not consent to the grade?—I cannot recall to my memory exactly the particular time, but I remember seeing the plans and profile that Mr. Carre had made, and I think it was, in presence of Mr. Fleming, discussed verbally, but there was no report about it, and it went further south than the other line. It crossed Cross Lake at a low level, about six feet above the level of the lake instead of about sixty as the constructed line does.

Railway Location—Contracts Nos. 14 and 15.

21500. Then that line must have been a change both on 14 and 15 if it crossed Cross Lake?—No; it came into 14 very near the eastern end of it—within a mile or so of the eastern end of it join 14. If I explain the nature of 14 you will understand it better. Generally speaking the end of 14 is laid on a level or prairie undulating sort of country, until it comes within a short distance of Cross Lake where it is very rocky, and the grade had to be raised from that point—run up to meet that of section 15. But that deviation that Mr. Carre made would have met section 14 on a lower grade, and consequently there is a considerable saving in it; but it did not give such a good grade rising eastward. It made forty feet to the mile instead of twenty-six and a-half.

Line suggested by witness would deviate from located line some six miles east of Cross Lake, and join it about a mile and a-half west of Cross Lake on 14.

21501. Do you remember how far east of Cross Lake that touched 15?—I think it commenced to deviate from the located line some six miles east on 15—east of Cross Lake—and it rejoined the line on 14 about a mile and a-half west of Cross Lake. I am speaking from memory, from my recollection of it.

21502. It was not during this first season that you visited section 14 that the bargain was made between Sifton, Ward & Co. and Mr. Whitehead, about finishing the eastern end of it?—No.

21503. That was the following season?—My impression is it was two years after that.

21504. At all events it was not the first season?—It was not the first season.

Profile on 15 showed very heavy work, sufficient time had not been taken to locate the line.

21505. I only want to get your story for the first season now: at the time of that first visit do you know whether you considered that sufficient time had been taken in locating a line through that kind of country?—I did not. The profile showed very heavy work—that is 15 you are speaking of?

21506. I am speaking now of 14 also, and of the Julius Muskeg; you visited 14 because it was then under contract: I am asking whether at that date you took into consideration the nature of the country, or had you seen the eastern end of it at that time—did you know much about the nature of the country?—No; I did not.

21507. Then during that season you did not take into consideration the nature of the country, and the question whether a full and proper examination had been made before locating the line?—I did not take it into consideration; it was too late for it then. The contract was let, and the work was being commenced at different points on the line, extending a great distance over the line.

21508. That was on 14: I am asking, while you were on 14, whether you had seen enough of that country to give consideration to the question as to whether a proper examination had been made before locating that line?—I had not sufficient knowledge at that time to give any opinion about it.

21509. Is there anything further connected with 14 and your operations of that season which you think it proper to explain now before we leave that subject?—I do not remember anything special.

21510. Had you formed any opinion while you were in Winnipeg, or in the neighbourhood, as to the proper point for crossing Red River?—Not at that time.

Railway Location—Contract No. 14.

21511. Then we come to the winter of 1876-77: I think you said that Mr. Fleming returned early in 1877, and took charge as your superior officer?—Yes.

21512. Although to some extent you had the management, because he was employed in office work making up the report?—Yes; that is right.

OTTAWA, Thursday, 5th May, 1881.

MARCUS SMITH'S examination continued:

Surveys, B.C.

By the Chairman:—

Reasons why Howse Pass was abandoned.

21513. Is there anything that you wish to add to your former evidence by way of explanation?—I think I may explain the reasons why the survey of the Howse Pass route was abandoned after considerable expense had been put upon it. At the commencement of the surveys it was supposed that that was not only the best route, but that it would be much shorter than any other route.

That a line by the Howse Pass would be shorter found to be an illusion.

21514. You mean in 1871?—In 1871; and I believe it was the general impression that that would be the line adopted. However, after Mr. Moberly's surveys it was found that the illusion with regard to the length at all events was dispelled, that in coming to the Columbia it was found impossible to get across the Selkirk range, across the arm of the Columbia lying west of the Rocky Mountains. The Selkirk range lies between the arms of the Columbia River, but it is west of the main range of the Rocky Mountains. No pass could be found through that.

21515. The Selkirk range?—The Selkirk range. Consequently a long detour had to be made north and north-westerly to the bend of the Columbia River at the Boat Encampment.

21516. You are speaking now of the course from the east?—Coming from the east. I am continuing Palliser's exploration.

21517. Not the Moberly?—No; not the Moberly, because it was not continuous. Arriving at the Boat Encampment the river takes a sharp bend southward, in fact, a little to the east of south. The line would have to follow that until it comes to the Eagle Pass, that is a pass through another parallel range of mountains—the Gold range lying between the Columbia River and the Shuswap Lake.

21518. Then this detour which you describe would bring one back to a point almost opposite the Howse Pass?—Just so.

21519. Upon the Columbia River?—Yes; but you see it made the difference I suppose three times as great as if it had gone straight across. I get that by the eye, looking at the map. If a pass could have been got straight through to the Eagle Pass the line would have been very short, the conclusion that Mr. Fleming came to after seeing Mr. Moberly's plan. They were sent home in the winter of 1871-72.

21520. Had you the opportunity also of consulting with Mr. Fleming and looking at these plans?—Yes; I was about to be appointed then, and Mr. Fleming showed me these plans so as to make me acquainted with everything that had been done as far as possible. This is Mr. Fleming's conclusion——

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21521. In his report of 1872?—Report of 1872, page 11. It is very short, and I will read it:

"Kamloops is an important point on the line which was being surveyed from New Westminster through the Eagle Pass to Howse Pass. The distance from Kamloops to a common point near Edmonton House is not greater by the North Thompson and Yellow Head Pass than it is by the Eagle and Howse Pass, while all information goes to show that a very much better and less costly line can be had by the former than by the latter route. Finding that Kamloops could be easier reached from the eastern slope of the Rocky Mountains by the Yellow Head than by the Howse Pass, there was no longer any object in continuing operations east of Kamloops on the latter route. This led to the adoption by the Government, on the 2nd of April, 1872, of the Yellow Head Pass as the gate to British Columbia from the east."

Distance really not greater by Yellow Head Pass than by the Eagle or Howse Pass while the route by it is better and less costly.

I may say that I concurred in these conclusions from the information we had then before us.

21522. That information was derived from an instrumental examination by Moberly's party?—Yes; detached portions, not a continuous line; but the difficult points were surveyed instrumentally.

21523. With profiles of them?—In fact the governing points and profiles made of them.

21524. Then you and Mr. Fleming had these profiles before you?—We had them before us.

21525. I understand that you and Mr. Fleming, early in the year 1872, both concluded that it was advisable to abandon the Howse Pass and to adopt the Yellow Head Pass?—Yes.

51526. Deciding upon the comparative merits of these two passes?—Yes. Of course Mr. Fleming had given far more consideration to the matter than I had. It was just about the time I was appointed, and I had only a cursory glance at the plans sent by Mr. Moberly. From that I agreed with Mr. Fleming. I did not suggest the abandonment, Mr. Fleming had concluded to abandon it and I concurred in his views.

21527. Does your judgment also accord with his as to the manner in which the expedition was started from the beginning?—No; I explained that yesterday.

21528. Then what you are explaining now is that the conclusion reached after Mr. Moberly's expedition, namely, to abandon Howse Pass, was one to your satisfaction as well as to Mr. Fleming's; but you say you do not alter the opinion you expressed yesterday as to the expediency of starting such an expedition as he did?—No; I think the same result could have been reached by a small party instead of a large one.

21529. While on this subject, I would like to ask you whether you have ever given your consideration to the course which was adopted in directing Mr. Moberly to retire from the examination of the Howse Pass, and take up the ground towards the Athabaska instead of going easterly through the Rocky Mountains to the open country?—I had nothing to do with these instructions, but I learned that Mr. Moberly had received such instructions. I think it was by telegram to Mr. Trutch, if I am not mistaken. I do not recollect exactly how it was conveyed; but Mr. Moberly had instructions from Mr. Fleming. Mr. Moberly had two parties. He had one party at the Eagle Pass. He directed that to return to Kamloops and go up the Thompson; but the larger, the main party, with which Mr. Moberly was himself, were at the Blaeberry River, that is the western end of the Howse Pass, where the Blaeberry River joins the Columbia. He received instructions

Witness had nothing to do with the instructions to Moberly to retire from examining Howse Pass.

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from Mr. Fleming to take that party down the side of the Columbia River to the bend of the river called the Boat Encampment, thence up what is called the Athabaska Pass, between Mounts Brown and Hooker, to Henry House, in the Jasper Valley.

Directing Moberly to go to the Boat Encampment and the Athabaska Pass turned out to be a mistake.

21530. Knowing what you do of the country, do you think that was the best course at that time?—We did not know anything about that country at the time, but it turned out to be a very bad course. There is no trail down the river side. It is very rocky and a great deal of timber, and the party wasted a great deal of time and suffered great privations from the difficulty of getting a trail down that way. It took all summer, and it was winter before they arrived at their work in the Yellow Head Pass. Mr. Moberly himself had intended when he got instructions to cross to the east side of the mountains and follow the trail down the Saskatchewan to Edmonton, and thence go westward from there by the trail. That is a longer route, but it is a route known. It was an actually existing trail; it is much longer of course.

21531. Would it have been a less expensive proceeding as you understand now?—Mr. Moberly alleges it would be so; but Mr. Fleming, in giving those instructions to Mr. Moberly, when Mr. Moberly objected to this and proposed to go eastward across the mountains and thence to Edmonton—Mr. Fleming telegraphed him back that they had information that these trails were in very bad condition at that time and reiterated his instructions to go to the Boat Encampment and the Athabaska Pass.

21532. You said in one of your late answers "we had no information at the time:" whom did you mean when you said we?—I mean the Chief Engineer—I mean the Department.

21533. Did you mean that Mr. Moberly had no information?—About what?

21534. About the nature of the country there?—Between the Howse Pass and the Boat Encampment on the river side?

21535. Through that country generally over which he was directed to proceed?—He had no information except on the narrow line he had surveyed; but he knew there was a pass eastward—he saw the pass.

The trail Moberly himself wanted to go very much longer than the route ordered by Fleming.

21536. The Howse Pass?—I mean the trail leading towards Edmonton; but if you look at the map, you will find it is a very long journey to Edmonton and back again to the Yellow Head Pass. It is three or four times the length of the route Mr. Fleming ordered him to go by.

But the engineer on ground **should not be trammelled** with instructions from Ottawa.

21537. Do you think that looking at the map is a fair criterion, or is information of the country itself better?—Certainly it is better. The engineer ought not to be trammelled by instructions from Ottawa—from headquarters—unless they had it from actual knowledge.

21538. The map does not afford the best information to enable one to judge of a route?—No; the map only shows a few passes, it does not show the topography of the country.

21539. Have you considered the subject of the expediency generally of directing operations in a difficult country, from a distant point, by persons who have not a personal knowledge of the locality?—The engineer in charge of the party in the country should have full liberty to act in governing the movements of the party, provided he carries

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out the general instructions. Instructions from headquarters ought to be very general. All the details of governing the party ought to be left entirely to the engineer on the ground.

Thinks Fleming was deceived by distances as shown on map.

21540. Would you say that these directions which were given to Mr. Moberly to retire from the Howse Pass and proceed northerly by the Athabaska, were given on sound or unsound principles?—I think Mr. Fleming must have been deceived by the apparent difference of distance on the maps. I think it would have been better to leave the matter to Mr. Moberly.

21541. Then do you say it was given on a sound principle or an unsound principle?—It is not a sound principle to give directions in a country that is not known. It is better to leave it to men on the spot.

21542. Do you know of your own knowledge whether, on this particular subject, I mean the movement of that party on that occasion, Mr. Moberly had the advantage of any other person who had a knowledge of the country: I think he mentioned another gentleman who agreed with him in the proposal to go easterly instead of retiring northerly?—I am not aware he had any.

21543. I think he mentioned Mr. Trutch, an engineer, and a man accustomed to the country?—That is the late Lieutenant-Governor. He was one of the delegates over here, Joseph Trutch. He knew nothing of the country whatever, except from hearsay.

21544. Is there another Trutch?—Yes; John Trutch, his brother.

21545. What is his profession?—Surveyor; but he had not been in that part of the country. All the knowledge they had was from hearsay.

Corrects his previous evidence.

21546. Is there anything further about that British Columbia section, the mountainous section, which you wish to explain?—No; I think not. In reading over my report I find some discrepancy. I think I stated that the surveys in 1875 were completed between Yellow Head Pass and Bute Inlet round by Fort George. I find they were not completed. Preliminary surveys were completed, but the final surveys for the location of the line were not completed until near the end of 1876.

21547. In 1876, you were at this end of the country?—Yes.

21548. At Ottawa?—That year there were no new surveys commenced in British Columbia. Mr. Cambie was sent over to complete and continue surveys that had been commenced before.

21549. I think you said that in 1876, Mr. Fleming was absent from the spring to the end of the year, in England, and that you were acting Engineer-in-Chief?—Yes.

Surveys in 1876 from Lake Nipissing to north of Lake Superior.

21550. Had you, as acting Engineer-in-Chief, charge of the manner in which the surveys were made that year of other portions of the country: for instance, north of Lake Superior: are you answerable for the method of surveying there in 1876?—The surveys made in 1876 from Lake Nipissing to French River, and from French River westward to the River Pic on the north of Lake Superior, were planned and made under my directions. The surveying parties received their instructions from me direct. One of those from Cantin's Bay on the French River to the South River, which runs near the east end of Lake Nipissing, was a locating survey, locating for construction. The survey further north from the same point, from South River to River Wahnapitaepee, was not a locating survey, it was a trial survey by instruments.

Surveys in 1876 from Lake Nipissing to north of Lake Superior.

21551. Had that been previously explored?—Yes; there had been many surveys made by Mr. Foster's engineer; a good deal of the country had been surveyed.

21552. This line, which was a trial location line as far to the north and west as Wahnapitaepee, was made under your instructions: was that the first instance of an examination of that country, or was it confirmatory of some other examination?—No examination had been made before of the country to the north-west of French River.

Country to north-west of French River very rocky, and there an instrumental survey necessary.

21553. Then you made it, in the first instance, with an instrumental survey?—A part of it, where it was rocky—very rocky. Mr. Ridout had charge of the survey, and part of it was made with instruments. I may explain to you that this is a country that an aneroid is of very little use in exploring. There is very little difference in the heights of the hills, but it is broken up with rocks, and an instrumental survey is necessary to ascertain anything like the cost of construction. There are no leading valleys; there are a number of rocks jumbled up like the waves of the sea.

21554. I understood you to lay down the principle that before making an instrumental examination of any country it was desirable to have a bare exploration, in order to see whether an instrumental survey might afterwards become necessary or justifiable: is that a general principle?—That is the general principle.

21555. And why did you adopt an exceptional course in this case?—It was a mixed course. Mr. Ridout went ahead to examine the country before making the survey.

From Wahnapitaepee to River Pic a purely exploratory survey.

21556. Then something like a bare exploration had taken place before making the instrumental surveys?—Yes. Then westward of that from the Wahnapitaepee to River Pic, which enters the north shore of Lake Superior, it was altogether an exploratory survey under different parties.

21557. What other examinations were made?—That completes the examination of that district between Lake Nipissing and the River Pic, and those were all the surveys that were planned and directed by me. Any surveys going on west—west of Fort Wiliiam, Lake Superior—had been planned by Mr. Fleming before he left, and the parties placed on them.

21558. Have you been over this country between French River and Lake Nipigon, or any part of it?—I have been over a part of it.

21559. Between French River?—Yes; I was over as far as Vermillion River, and followed down the Vermillion River and Spanish River to Lake Huron.

21560. That was the time you took the boat from there to Fort William?—Yes, that was in 1876. I have not seen anything of it since.

21561. Have you at any time seen any of this country in a north-westerly direction from Lake Nipissing to Lake Nipigon?—No, I have seen no more of the country. I have seen all the plans and profiles that have been made of different surveys and explorations.

21562. I wish to get from you an opinion, if you are able to give an opinion, upon the subject of the examination of that country by bare exploration or by instrumental examination, and what, in your opinion,

Character of Surveys.

would have been the best course in the public interest to have pursued for the purpose of acquiring such information as the Engineering Department required?—Oh, I would certainly have proceeded in the same way I have described, the way surveys are generally made—an exploration first by a competent engineer that had good judgment. Of course it requires considerable experience to walk through a country and give an opinion of it without instruments, but any competent engineer can do it.

In examining country between Lake Nipissing and Lake Nipigon in witness's opinion the proper course was to have commenced with bare explorations.

21563. Do you know what was the course pursued concerning this particular country north of Lake Superior?—I believe the first surveys were instrumental. That was in 1871. There have been surveys since, exploratory surveys, and even last year the surveys were exploratory.

21564. Have you had any opportunity of judging of the necessity or efficiency of those instrumental surveys in 1871?—No; I never saw them—they were burnt up.

21565. Have they been available, as you understand, for the purposes of this railway: have they given any such information as was expected?—Of course if the plans were burnt up they were not available. The reports that had been made were available as giving a description of the country. They have been of use in comparing this with more recent surveys.

21566. Have they been of sufficient use to make the expenditure which was made in your opinion justifiable or expedient?—No; I think not. I think I should have preferred to have thoroughly examined the country and almost decided upon the line or lines before I made the instrumental surveys.

The reports made of the instrumental surveys not of a character to justify the expenditure.

21567. I suppose you are aware that this subject has been one which has been discussed a good deal in the public newspapers and in Parliament, as to the necessity of the expenditure upon this kind of survey?—I have seen by the newspapers that the expenditure has been complained of, but I do not remember any special cases that were complained of.

21568. As you have noticed this discussion in the newspapers, it is probable that, as an engineer, you have given the matter some consideration?—You will find, by the letter I put in yesterday, that before it came up in the newspapers at all, I gave my opinion in favour of the system of exploratory surveys first. That was the first letter I wrote after my appointment in 1872.

In first letter written by witness after his appointment in 1872, gave his opinion in favour of exploratory surveys preceding instrumental.

21569. From what you now know of this country north of Lake Superior, have you any decided opinion as to the expediency of bare explorations preceding instrumental surveys?—Yes; I think it is just as applicable there as elsewhere, but not as much so probably as in the mountains; but still it would be applicable there as well as anywhere else.

Management of Engineering Department.

21570. I think you explained, yesterday, your course of proceeding down to February, 1877: would you state what course you took after that?—I do not know that I explained very clearly about the position I stood in with regard to the works under construction at that time, from 1876 to 1877. All the works under construction, and those for which tenders were invited, had been planned and designed by Mr. Fleming before the date at which I acted as Engineer-in-Chief. My duties, then, when I commenced to act as Engineer-in-Chief, were to

Witness's duties as acting Engineer-in-Chief to carry out Fleming's plans and designs.

Management of Engineering Department.

carry out Mr. Fleming's views with regard to this work let for construction. I did not think that I was entitled to make any radical changes in the designs and plans, but I made minor alterations that would improve the line, and make the work less costly without interfering with the general design.

21571. Did you understand that your position continued the same in 1877 as that which you have now described: that although acting Engineer-in-Chief you had not absolute control of the character of the works?—Of the works under construction it continued the same.

On each occasion when Fleming went to England on leave, he left behind plans for witness to carry out.

21572. Then, do you mean that upon each occasion when Mr. Fleming went on leave of absence to England, that he left behind him some distinct view which you were to carry out?—Yes; these views were expressed in many ways, and there was a specification attached to contracts, and the works would be discussed while he was present in Ottawa. I generally had to carry out his views in his absence as far as practicable. I may say I made some alterations without altering or destroying the general character of the design of his plans.

Railway Location and Construction.

21573. These views which had been expressed by Mr. Fleming would not curtail your authority so as to prevent a deviation of the line: for instance, if a better one could be got as the work was going on?—No, it would not; but such deviations were confined within very narrow limits. Section 14, as you are aware, was located, and section 15 had to meet it somewhere. I may state that sections 13, 14 and 25 were all let and under construction before I had anything to do with the works, and section 15 was so far advanced in the location surveys that tenders were called for soon after, or had been called for at that time, I do not remember now.

21574. You are aware the work was not let upon the first call for tenders?—Not on section 15. I am aware of that.

21575. Tenders were called for on three separate occasions, and it was on the last occasion the contract was let?—Yes.

21576. Section 14, I understand you to say, was established before you took charge as acting Chief Engineer?—Yes.

21577. So that the end of it, the eastern end of it, was in fact fixed?—Yes, and the western end was partly constructed.

21578. The eastern terminus had been decided upon?—Yes; there was a line and profile made through the whole length of the section to Cross Lake, where it joined 15.

Survey made in 1877 of Georgian Bay Branch, under witness's directions.

21579. We are speaking of your progress and your operations in the year 1877: do you remember what course you took in that season?—It was in July, 1877, I left Ottawa. There was another survey made of the Georgian Bay Branch in 1877. It was made under my directions, but I did not visit that district again that year; I went direct to Thunder Bay and I examined contract 13, which was then nearly completed—that is the first contract from Fort William westward. I went over part of contract No. 25, which is a continuation westward from the last one. I then went round to Red River. I went round by steamboat, railway and stage to Red River—to Winnipeg.

Witness went to Thunder Bay and examined 13 and part of 25.

21580. Steamboat on what water?—On Lake Superior.

Railway Construction—Contracts Nos. 13 and 25.

21581. You mean that you came back to Fort William after looking at 13 and 25; you did not go through the country?—No, I did not go through the country; I had gone through the country the year previous.

Found 13 nearly finished, and that a deviation was being made on 25.

21582. Do you remember anything particular connected with either of those sections, 13 or 25, which came under your notice that season?—No; 13 was nearly finished. There was nothing remarkable about it, but on 25 I found that there was a deviation being made from the line on which the contract was let, which shortened the line, it was estimated, something like one mile and three-quarters, but that involved either a deep rock cutting or a tunnel. I did not allow the deviation to be made at that time, but gave the district engineer, Mr. Hazlewood, instructions to have a survey made both of the original line and of the deviation at the points where they joined, and make an estimate of the difference in the cost in constructing these lines, and as I was going westward then I directed him to send that report to Ottawa to be examined by the Minister. I also wrote to Ottawa stating that if the extra cost was not very great in making the deviation, it would be advisable to make it on account of the shortening of the distance.

21583. To whom at Ottawa did you address your communication?—It was either directed to the Secretary, or to my chief office assistant, Mr. Smellie. I think it was to him I addressed it. I saw it the other day amongst the papers. I remember the facts very well.

21584. Did you decide finally upon the building of the tunnel or that deviation?—It was decided, in my absence, to build the tunnel.

As the deviation cost a great deal more than the original line would have cost Hazlewood in an estimate sent to Department must have made a mistake.

21585. By whom?—By the Minister. My assistant explained to the Minister what I had written to him, and went over Mr. Hazlewood's report. Mr. Hazlewood reported that the cost of making the deviation would only be some—I think it was $2,000 or $3 000, and the Minister was perfectly justified in making the deviation on that report; but it subsequently turned out that it cost more than $60,000 more. It cost a very large amount more than the original line would have done, so that Mr. Hazlewood must have made some mistake in his report.

21586. Do you say that you have seen those original papers lately?—Yes; I could get the original papers. I could bring them over this afternoon if you like.

21587. Please do so. Do you understand that that was finally decided in the year 1877?—Yes; in the year 1877.

21588. That was while Mr. Fleming was in England?—While he was in England. Yes.

21589. Was the decision made in Ottawa as to the manner of carrying out that deviation—I mean whether it should be a tunnel or an open cutting, or was that your individual judgment?—The decision, whatever decision was come to, was on the strength of Mr. Hazlewood's report. I could not make any decision without a survey, and I was absent while the survey was made.

The decision that deviation should take place made at Ottawa.

21590. But was the final judgment given by you based on Mr. Hazlewood's report—I mean who made the decision at last that the deviation should take place in the way that it has taken place?—It was made in Ottawa, I think, between Mr. Smellie and the Minister.

21591. We have understood from Mr. McLennan's evidence, who was assistant under Mr. Hazlewood, that that work cost considerably more

Railway Construction—Contracts Nos. 13 and 25.

in the shape in which it has been done, than it would have cost if it had been an open cutting; has that matter occupied your attention?—No; it has not. I do not know why it was made a tunnel instead of an open cutting.

21592. It was not by your judgment or decision?—No; the whole decision was based on reports from Mr. Hazlewood.

Making a tunnel not witness's decision.

21593. But besides the basis for the judgment, I am endeavouring to ascertain who gave the judgment?—Probably those papers will show. I do not know.

21594. At all events you say it was not by your decision or judgment that it was made a tunnel instead of an open cutting?—No; it was not.

Recommended embankment should be made of material less friable than that which was being used.

21595. Is there anything else connected with that section 13 or 25 that attracted your attention before you left it that summer?—Yes; I found, on crossing some narrow valleys where high embankment was necessary, that the material with which the embankments were made and which had been taken from the line cuttings—through cuttings we call them—was clay of a very friable nature, so that when rain fell the water got into it, the bank spread out very wide, and large land slips took place and the embankment slipped away. That was causing a very large extra amount of material to be required. After fully discussing the matter I came to the conclusion that it would be better not to make up the embankment any further with that material, but to bring material from some few miles distant, gravel and sand, that would stand. It had to be brought by locomotive and waggons and the contractor agreed to do that at ballast prices instead of earth prices. I found, on making an estimate of the quantity required that it would be more economical to use that, although the price per yard was higher; it would require so much less of it to make the embankment, that it would be the most economical way to do it, and I recommended that to be done.

21596. To whom did you recommend it?—To the Department.

21597. Then, in such a matter as that, you were not acting at that time apparently on your own discretion, because you say you recommended it: do I understand that you were not then acting as Chief Engineer?—Yes; as Chief Engineer I advised it to be done.

21598. To whom did you offer the advice?—To the Department—to the Minister. It would come through my chief assistant.

Witness though acting Chief Engineer could make no changes adopting more expensive material without the authority of Minister.

21599. But were such matters as that decided upon at that time by the Minister and not by the Chief Engineer?—I could not make any changes, in adopting more expensive material than what was called for in the contract, without submitting it to the Minister for his approval.

21600. It was not then because Mr. Fleming was the Chief Engineer that you found it necessary to submit that, but if you had been Chief Engineer yourself you would have considered it proper to submit that particular transaction to the Minister?—Just so.

21601. Is there any other matter connected with it?—I am not sure that that thing took place that year. I fancy it was the following year, but it is all relative to that.

21602. You were over this same ground the following year, in 1878?—In 1878 I was over it again

Railway Construction—Contracts Nos. 13 and 25.

21603. As you have touched upon what took place in 1878, do you remember any other feature of 13 or 25 that, either in 1878 or 1877, attracted your attention?—There was no other feature, except that it was found at that time that the quantities of earth excavations were going to exceed, to a very large extent, the original quantities in the bill of works. I made enquiries. I was directed to make such enquiries by the Minister before I left, of the cause of that excess. I found that the location of the line had been changed very considerably from the original line on which the contract was let. Those original lines were just a rough trial survey, and they were not even joined in the middle. I believe they passed each other some considerable distance between the two, and the change in the location had the effect of requiring a great deal more earth, but it lessened the rock work. At that time the works were not so far advanced, they were up about the neighbourhood of Savanne. That is about seventy miles, I believe, from Fort William. I saw nothing with regard to muskeg that was causing in the works up to that time—that was causing any extra quantity by shrinkage or by subsidence; on the contrary, there were places where there was no earth hardly. They had to gather stones together, loose boulders, to form the base of the road. There was no earth at hand. They had to bring the earth to cover those from a considerable distance with the locomotive engine and waggons, and I saw no very soft places up to that point that would waste a large amount of earth. I saw no earth being used that was improper for the purpose.

Quantities exceeding estimates.

Considerable changes made in original line which increased earth but lessened rock.

21604. Then, in 1877, you say you came back to Fort William and took steamer for Winnipeg?—Yes; and railway to Winnipeg.

21605. And to what matter did you next give attention?—I had special instructions from the Minister before leaving to make an examination of the country westward from Red River, as petitions had been sent in from people in Manitoba and the North-West Territories asking for the line to be changed—the location of the line to be changed—from the original route, which was by the Narrows of Lake Manitoba, and those petitioners wished the line to be changed south of Lake Manitoba. A Committee of the Senate had investigated the matter—I think it was that same Session, the winter of 1877. It did not appear, from the evidence, that there was much chance of getting a practicable line, but the Minister directed me to go and make an examination to see if it were possible to get a line westward from Red River and south of Lake Manitoba. I had one assistant, Mr. Lucas, with a small party, to make instrumental surveys. He did not make continuous instrumental surveys, but examined the country between the different points on the valleys. There are three great valleys to cross, the Little Saskatchewan, the Bird Tail, and the Assiniboine Valley. He travelled up and down those valleys examining feasible crossing places, and when he found a feasible crossing place he made an instrumental survey of it. He succeeded in getting a good crossing of the first valley, that is the Little Saskatchewan, very near where Rapid City is now rising. At the Bird Tail Valley he did not get a good crossing. There was a square crossing that he got requiring a bridge about 3,000 feet long and 175 feet deep in the deepest part. He also failed in getting a feasible crossing on the Assineboine, near Shell River. It had been suggested by the people in the district that that was the most likely place to find a crossing, by using the Valley of Shell River for some distance which joined the Assine-

Surveys west of Red River.

Directed to see if it was possible to get a line west of Red River and south of Lake Manitoba.

Lucas got a good crossing on the Little Saskatchewan, but failed to get a crossing on Assineboine near Shell River.

Surveys west of Red River.

boine. Mr. Lucas then went further westward to improve the to located line on towards Edmonton. I followed the trail Fort Ellice and examined the country by the Touchwood Hills on to the South Saskatchewan. The results of that are given in the report of the surveys for that year, and it is stated that the information obtained was not sufficient to warrant any change in the location of the line at that time. During my examination of the country I paid attention to the soil as well, and I found the soil near the Qu'Appelle River very light, and I was informed that it continued light southward of it too, and by various people whom I met that the best soil would be found further northward, and it was so interesting that instead of returning from the South Saskatchewan I went on to Carleton. There I got information with regard to the nature of the soil, which confirmed the idea previously heard on my journey that the real fertile belt for wheat growing extended from Winnipeg away north-westerly crossing the Saskatchewan near the Forks, a little below Prince Albert, and thence on to Lake la Biche and Peace River.

Witness examined country on the South Saskatchewan.

Went on to Carleton where he got information regarding the real fertile belt for wheat which extends into the True Forest country.

21606. That belt extends apparently into the True Forest district?—Yes, it does. It has generally been described—in fact the line is laid down in Palliser's map showing the southern boundary of the True Forest. In fact north of that is really in the True Forest country, but I may inform you that there is a large amount of prairie in it, caused, I think, by the burning of the woods, the grass comes up afterwards and aspen. There are very large tracts of prairie ground within that belt.

21607. But it is within what is known as the True Forest district?—Yes; it is.

21608. That same belt, I think, was traversed by Mr. Jarvis, in 1874 and 1875, by exploration?—Yes; partly so—part of it.

21609. Proceed?—When at Fort Carleton, I ascertained from the Chief Factor there, Mr. Clarke, that the company's steamer would be up in a few days going to Edmonton, and I intended to return to Winnipeg by that steamer, but I found that I would have time to go up as far as Lake la Biche, some 300 miles north-west of Fort Carleton. I did so, and thence struck southward from Lake la Biche to Edmonton. I obtained a vast amount of information from the bishop at Lake la Biche, who had been a number of years in the northern district. He sent for Indians and hunters and half-breeds, to describe any portion of the country that I asked about, and translated it to me. I got information extending up right to the Pine River Pass—information of the country. That is near the Peace River. On arriving at Edmonton, I found the steamer had not arrived. I waited for several days until the mail came in and letters which informed me that the steamer was not coming at all that season and had turned back. Letters received by the same mail also reported the massacre of some of our depot clerks at Henry House, or Athabaska Depot we call it, by Indians. It was necessary to make some enquiries into that matter, and there was a pack train of mules then at Edmonton, which had come over from British Columbia the previous year, and was about to return to British Columbia. I therefore decided to go with the pack train instead of returning eastward to Manitoba. We left Edmonton some time in August, and followed the usual route up to Jasper Valley, thence through the Yellow Head Pass, down to Tête Jaune

Decided to go with a British Columbia pack train to British Columbia, through Yellow Head Pass down to Tête Jaune Cache, and the Albreda to the North Thompson.

Surveys west of Red River.

Cache, and the Albreda to the North Thompson; thence down the North Thompson to Kamloops, and following the river down to where the two branches of the Thompson met, then down to Lytton, and thence down to New Westminster, so that I followed the route of the Pacific Railway from Edmonton as now adopted by the Government.

21610. About what time of the year did you reach Westminster?—I reached it about the latter end of September.

Surveys, B.C. Second series of surveys.

21611. And then?—Surveys were being made; the second series of surveys were being made of that route that year. I examined it very closely, and examined their plans and profiles, the progress of the surveys, and gave them directions where they required any. I only stayed a few days in Victoria, and returned by way of San Francisco and St. Paul to Winnipeg. I then went and examined, in October, a portion of the works on section 14. It was, of course, considerably further advanced than it had been in the previous year that I examined it. That was my last work of the season, I returned to Ottawa in November.

Railway Construction—Contracts Nos. 14 and 15.

21612. During 1877 you saw no part of contract 15?—No; I did not. I endeavoured to go and see a portion of it, and went as far as the North-West Angle of the Lake of the Woods by the Dawson route. There the steamer, by some misunderstanding, had come there and gone away without me. I returned to Winnipeg and telegraphed to Mr. Carre to meet me there with all his plans and profiles. He did so, and I examined them then; examined the plans and profiles and discussed the progress of the work, giving him any instructions that he required on any questions that had arisen.

51613. The work was then under construction: it had been let in the January of that year?—Yes. A small portion of it only was under construction, that is the end next Rat Portage—the east end.

In 1877, no question had yet arisen as to the terminus between 14 and 15.

21614. Do you know whether, up to that time, any serious question had arisen as to the propriety of the terminus between 14 and 15?—Not at that time.

21615. A terminus seems to have been adopted upon the promontory, and which, perhaps, has led to some difficulty about the location of a better line, inasmuch as the engineer of each section appears to have had an opinion that he could not invade the territory of another?—That question came up at a later date, as the construction parties approached that point.

21616. But at that period you say there was no discussion about it?—There was no discussion about it.

21617. The work, as I understand it, was progressing on section 14 easterly from Red River, and on section 15 westerly from Rat Portage, but had not progressed far enough to approach this difficult spot?—Yes, there may have been discussions with regard to trial surveys that had been made, but there was no pressing discussion to settle the point at that time, because the works of construction had not advanced far enough towards the point.

His attention not called to Cross Lake.

21618. Then I understand that your attention as Chief Engineer was not called to that particular locality—the neighbourhood of Cross Lake?—Not at that time.

Surveys.

21619. We have got now as far as the latter part of 1877?—Yes.

21620. You were obliged to return to Winnipeg, and thence?—I was engaged in the office during the winter in the usual manner in Ottawa, writing the report and examining the plans being made.

21621. I suppose your general conclusions will appear in the report of 1878 then?—Yes.

As acting Chief Engineer wrote appendix D, report of 1878.

21622. Did you continue as acting Engineer-in-Chief?—Yes; as Mr. Fleming was absent in England—he had got a prolonged leave of absence. In the spring of 1877 he left Ottawa, and I continued to act as Chief Engineer during his absence. In that capacity I wrote the report of 1878, appendix D, page 41. I wrote that report, and accompanying that report I constructed a map to illustrate it.

21623. Does that map which you say you constructed appear in the ordinary reports of 1878?—No.

21624. Do you know why?—I do not know.

Character of Soils.

The map which he drew to accompany this report **did not appear** in the ordinary report.

21625. How does it happen, if you were Engineer-in-Chief, it does not accompany your report?—I can tell you all that I know about it. The reason of my constructing that map was to show the general relative position of the different kinds of soil, masses of soil, so that any one reading the report would be able to follow it much better. In most of the reports before that, any mention made of the soils were simply detached illusions to the soil. This I thought better to show the general nature of the country at one glance. That is constructed by my assistant, Mr. Lucas, from the best information we could get at that time. We had the Palliser reports; we had the reports of all the previous surveys of the engineers of the Canadian Pacific Railway; we had the reports of the Geological Survey, and reports of people who had travelled in the country. Everything that was reliable that we could get hold of was used to construct this map. I submitted it to the Minister, and he approved of it, and ordered several thousand copies—I think it was 3,000—to be printed.

Fleming telegraphed for, who said Minister wished him to write a report.

21626. Then, why did you not have that appended to your report if you were Chief Engineer?—The report was sent in to the Department with the map attached to it, and without my knowledge, Mr. Fleming was telegraphed for to come from England, on important business, I suppose. On his arrival here he said: "You have written a report?" I said: "Yes." "Well," he says, "the Minister has asked me to write a report." I replied I should be very glad to give him all the information I had obtained during his absence. He said he did not require that, he had read my report—it was then in manuscript and was not printed—but I told him there was a great deal of information that he ought to have that was not given in detail, that that was simply an abstract of it given in the report. However, he was satisfied with the information he had. I may mention, that in all the surveys that had been made to that date from the commencement, they simply stated facts; no recommendation had been made with regard to the route, not by me, nor, I think, by Mr. Fleming, and this paragraph in my report, page 53, I will read:

Which Pass?

Witness recommended route by Pine River Pass to Bute Inlet.

"In conclusion, the writer is desirous of expressing his strong conviction, as the result of detailed investigation of the subject in all its bearings, that the line by the Pine River Pass to Bute Inlet, with extension by steam ferry to Vancouver Island, will prove the true route whether regarded in its national or economic aspect. It traverses a far greater extent of good agricultural lands, and affords better communication with the chief gold and coal mining districts than any other route."

Which Pass ?

That is the first time I had ever recommended any route. It appears that the Minister had different views from that; that he favoured the route by the Yellow Head Pass to Burrard Inlet. Hence Mr. Fleming was sent for to report. His report favoured the Minister's views, for what reason I do not know.

The Minister had different views, and favoured the Yellow Head Pass.

21627. You were speaking of a map which you had constructed, what became of that?—Mr Fleming made a report, and Mr. Cambie made a report, neither of them submitted their reports to me before they were sent in. I never saw them until they were printed, and my own was printed at the same time. When I got a copy of the printed report I found the map had not been attached to it.

Map suppressed.

21628. You mean the map you had constructed?—The map I had constructed. I wrote to the Secretary of the Department, Mr. Braun, complaining of this, and pointing out that it was not only unfair to me but to the public; that it was called to read a report describing several lines over 2,000 miles of country without a map being before them, and asked the reason why it had not been published, and I got no answer to that. I demanded of Mr. Fleming why the map had not been placed. He made some objections to it which, I thought, were trivial, and said I had not sufficient information to construct such a map; that there might be some parts of it inaccurate. My reply to that was that it was constructed from the best information obtainable at that time, and, as far as accuracy was concerned, there never was a map in the world constructed that was accurate, but approximately so, and I thought the objections trivial. However, he was the Chief Engineer, and he advised the Minister not to issue it, I believe.

Fleming said witness had not sufficient evidence to construct such a map.

21629. From the time of his return upon that occasion, did he resume the control as Engineer-in-Chief?—He resumed it entirely, and had the whole control when he arrived here. Formerly, when he had come to Ottawa, two different times from his leave of absence, he had given instructions through me to have them carried out by the staff, but from his return, in the spring of 1878, he gave the instructions direct to the different parties, and I did not know what instructions he had given.

From spring of 1878, Fleming gave instructions direct to the officers instead of through witness.

21630. What become of you? In what position were you left?—I was left in a very unfortunate position. I found, when I went on the works, they were doing works for which I had given no authority.

21631. After his return, in 1878, what was your actual position on the Pacific Railway staff?—Of course, I was only acting Engineer-in-Chief in his absence. At any time he was present, he was Chief Engineer.

21632. What was your position?—First assistant or deputy to the Engineer-in-Chief. I was first assistant. I only assumed the duties of Chief Engineer in his absence. These ceased the moment he arrived and was present.

21633. He went away again early in 1878?—Yes; he went away again, I think in May, or June.

Fleming went away again in May or June, 1878.

21634. That was the time the difficulty arose as to who was responsible for the change in the character of the work on 15?—Yes; and it was very thoroughly investigated before a Committee of the House two years ago, and in the Senate, too.

Contract No. 15.

Management of Engineering Department.

21635. Was there any understanding between you and the Chief Engineer, upon the occasion of his return in the spring of 1878, as to what duty you should take after that?—No; I had no conversation with him whatever. He was a short time here and was very busy writing his report, and he sent in his report without even submitting it to me, which was very unusual, as up to that time there was thorough confidence between him and me. I had seen everything he had done; but for reasons I do not know he had no conversation with me about the works at all.

Fleming left for England without leaving witness any directions.

21636. Then did he leave for England without consulting you at all?—Yes.

21637. And without leaving you any instructions about the work?—Yes.

21638. And on his leaving you were the acting Engineer-in-Chief again?—Yes.

21639. And he returned to England without communicating to you his directions, his wishes, or his views?—Yes.

Pass.

Witness thought line by Yellow Head Pass altogether wrong.

21640. Did you assume complete control of the undertaking from the time he left for England in the spring of 1878, or were you still governed by his previously expressed views on matters connected with the works?—The works under construction were still governed by his previously expressed views, but you will observe that in this report of 1878, recommending another route, that I departed entirely from his views there, and acted on my own judgment from information that I had obtained in travelling over the country in 1877. It appeared to me that the route chosen by the Yellow Head Pass was altogether wrong. Mr. Fleming was in England. I had no time to consult him or to place my views before him, and I wrote them direct to the Minister, and probably he may have been offended at my assuming to be original in anything.

Railway Location.

Had seen a line which would have struck Red River between Winnipeg and Selkirk, but contract 14 had been previously let.

21641. While speaking of those rival routes, I would like to ask whether you have formed at any time up to now any opinion as to the route from Rat Portage westward, whether it should go to Winnipeg or Selkirk for instance, or whether it should go north or south of Lake Manitoba?—Yes; I had seen a plan that was made before I had anything to do with that part of the works, made by Mr. Carre. The survey deviated from the present located line a very short distance from Rat Portage and bearing more to the south, following very closely the side of that part of Lake of the Woods called Clearwater Bay, and thence to a small lake called Crow Lake, and thence westerly near to Falcon Lake, arriving at that point near Falcon Lake from ten to twelve miles south of the previously located line.

21642. You mean the present adopted line?—Yes; south of the present adopted line. From that point near Falcon Lake, the proper course westward would have been to have struck Red River a considerable distance above Selkirk.

21643. You mean further south?—Further south. It would have struck it about half way between Selkirk and Winnipeg; but section 14 had been previously let.

21644. For the present, irrespective of the letting of section 14, I would like to get your opinion upon that line that you are speaking

Railway Location—Contracts Nos. 14 and 15.

of, as if there were no such thing as section 14?—That line, no doubt, would have effected considerable saving in the cost of construction, for this reason: the rocky country—the Laurentian rocks—bears in a north-westerly direction from Lake of the Woods, and south-easterly. This new line that was run by Mr. Carre bears a little to the west of south, south-westerly, consequently it left that bend of rocks very much sooner than what the westerly line did.

This line would have effected considerable saving.

21645. You mean sooner going in a westerly course from Rat Portage?—Yes; I do not know how many miles shorter the line was in the rocky country than on the located one in which the works are constructed, but it was several miles shorter, and then it got into a prairie country—prairie and wood. From that point westward there would have been no more difficulty in constructing a line to Red River than what there was from Cross Lake on section 14; but section 14 had been let at that time and partly under construction, and therefore it was necessary to make a bend in the new line near Falcon Lake, running more to the north-west so as to intersect that line.

21646. You do not mean that it was absolutely necessary, but that it was a question of expediency in consequence of the work already done on 14?—If it had been carried on, as it would no doubt have been, only for that work being let—there was a very considerable amount spent at that time on section 14.

This line would have been adopted only that 14 had been let and it was necessary to meet 14.

21647. As much as $60,000?—Yes; it would have been better to abandon that line.

21648. You mean to abandon the present line of 14 if the loss in work up to that time was only $60.000, or thereabout?—Yes; there would have been a larger saving than that on the new line; I do not know how large, but it was estimated at something like $300,000.

It would have been better to abandon the work on 14, even though $60,000 was lost.

21649. That line which you now speak of, and which we may call the Carre and Jarvis line (for I understand that Mr. Jarvis ran it westward from somewhere near Falcon Lake), would lead you to some point further south than Selkirk on Red River?—Yes.

21650. Have you considered whether that point further south for a crossing was as good a one in the public interest as Selkirk?—I think it is quite as good, and would have been a great deal more popular among the people.

A better crossing than Selkirk for a bridge could have been found where the above line struck Red River.

21651. Irrespective of its popularity, would it have been as good a crossing?—I think that quite as good a crossing, if not a better one, could have been found there for a bridge.

21652. That would be somewhere in the neighbourhood of Stone Fort, would it not?—Higher up than that; further south.

21653. Then that would have involved some change in the line west of Red River: how would that affect the matter, in your opinion?—It would have lengthened the line to have followed by the Narrows, but since the line has been changed to the south of Lake Manitoba it would have been better than the present line.

21654. At the time that you were considering the expediency of this southern line—I mean the Carre and Jarvis line—did you take into consideration the probability of the line going north or south of Lake Manitoba, so as to make it a factor in forming your judgment?—I had

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nothing to do with that; it was Mr. Fleming submitted this to the Minister in his report, I simply saw it, being in the office.

21655. But I understand that, as an engineer, you formed some judgment upon it?—Yes; I talked with Mr. Carre about it.

Great opposition to line going by the Narrows.

21656. Then, while you were forming that judgment did you take into consideration the probability of the line going north or south of Lake Manitoba?—It was an open question then where the other line would go. There was a great opposition to it, and general discontent about the line going by the Narrows. Great efforts were being made to have it deflected south of Lake Manitoba, and there was a probability that it would be done so.

Surveys, B.C.

Exploration from Fort George to Lake Fraser thence to Port Simpson.

From Fort George through Pine River Pass. The first time a white man went through the pass.

21657. Is there anything that you wish to add to your previous evidence by way of explanation?—I find in giving an account of my exploration up to Lake la Biche, in 1877, that, in conjunction with that, there was an exploration on the west side of the Rocky Mountains, from Fort George westward to Lake Fraser, and following the old telegraph line of the Western Union Co. to Skeena, and thence down the Skeena to Port Simpson. That was made by one party, and from the same point, Fort George, there was an exploration made to MacLeod's Lake, following the valley of MacLeod's Lake, and from MacLeod's Lake eastward through the Pine River Pass. The party succeeded in getting through the pass and got some twenty or thirty miles east of it on the Pine River, and returned. That was the first time ever known a white man ever went through that pass. It had been talked of, but never explored.

21658. Who made that exploration?—Mr. Hunter. His report was remarkably favourable, and it has been confirmed by subsequent exploration.

21659. What was the distance from that to Lake la Biche, which you touched?—It was considerable—several hundred miles. It was about 300 miles from the point that I left off, Lake la Biche, from that which was run by Mr. Hunter, from the west, but all that country was known. An engineer had never been through it, but it was known to several people.

21660. Had Mr. Horetzky explored part of it?—In 1872, he had gone across part of it, near Lesser Slave Lake, and he ascertained quite a good deal of knowledge about the country, from people living there, Hudson Bay Co.'s officers and others, besides what he saw himself. I believe he was the first to suggest that pass, Mr. Horetzky.

Marcus Smith's Report of work done in 1877.

21661. I understand that your report of the early part of 1878, was based principally upon the knowledge which you had acquired in that trip of yours, in the fall of 1877?—Yes; together with the reports of the exploration westward.

21662. And your trip was undertaken unexpectedly by you, owing to circumstances arising at the time?—I did not think I should get so far as Lake la Biche.

21663. But the continuation of it westerly was owing to circumstances which you did not anticipate?—It was my suggestion that the western exploration was made by Messrs. Cambie and Hunter.

Railway Location—Smith's Report.

21664. Had you any unusual directions as to such a report as you did furnish in the beginning of 1878?—No; I wrote a report in the ordinary course of my duties, stating what I had done the previous year.

An engineer has to report upon everything.

21665. In the ordinary course of an engineer's duties, what subjects is he called upon to enquire into and report upon—I mean a railway engineer?—That year there was both construction going on and surveys for location. I had to report on them both. An engineer has to report upon everything—all kinds of operations that are going on.

21666. In selecting a location as an engineer, is it the rule that he is required to investigate subjects beyond those of physical difficulties, for instance?—Oh, yes; generally in a country like this that is not known, in exploring he is expected to get all the information he can as to the soil as well as the physical difficulties of constructing a railway—soil, timber and produce.

Soil, timber, produce, these bear on the question of location.

21667. Why would these be within the field of his investigation?—Because they all have a certain bearing on the location. It is not the physical difficulties alone of construction; it sometimes would be advisable to construct a line that would cost a good deal more on account of the country having more resources.

21668. Of course, there are some questions which might weigh with the Government in deciding upon a route, which would not be strictly engineering questions, and which would not be proper for an engineer to investigate?—Certainly.

21669. Could you explain shortly the difference between those questions, or could you name them as distinguished from the subjects which an engineer should investigate?—The particular duty of an engineer is to get the physical features of the country, to ascertain them and exhibit them by maps and profiles, so as to form an idea from which he can get the quantities to form an estimate of the cost of constructing a railway across the country; that is his special duty.

21670. To ascertain specially the shape of the surface and the kind of material over which it will pass?—Yes; at the same time, he is expected to take notice of the general products of the country, and the nature of the soil and timber, and if he sees any crops, what they are like. That is incidental to the other; the other is the main.

Geology and botany examined by specialists.

21671. Would you mention the subjects which would be peculiarly within the discretion of the Government as distinguished from its engineers?—The geology of the country is examined by officers of the Government, and also the botany of the country by specialists.

21672. I do not know that I have made myself understood: I do not at present ask what means the Government took to ascertain the different data, but I am asking you to define, if you will, those subjects which a Government would, irrespective of engineering views, deal with, as leading up to their final decision, and as distinguished from the subjects which an engineer should investigate for the information of the Government?—Well, there is the soil of the country, the timber——

21673. Would that be for the Government?—Certainly.

21674. That would be within the Government's jurisdiction, and not the engineer's?—Certainly, in a line like this. This is practically and

Railway Location. Smith's Report.

specially a colonization railway, made through the country to develop the resources of the country.

21675. Do I understand you to mean that that question of colonization is a Government question, and not an engineering question?—It is a Government question.

21676. Are there any other matters which are peculiarly Government questions, or questions of Government policy?—Well, there is the geology of the country.

21677. Is that excluded from an engineer's field?—Yes.

Geology, botany political and Imperial considerations excluded from the province of an engineer.

21678. And what else would be excluded from their particular field of investigation?—There is the flora of the country, as indicating the nature of the soil; it is a botanist's special duty.

21679. That would not be within the engineering jurisdiction?—No.

21680. Is there any other subject which would be a matter peculiar to the Government?—All the political questions, of course, as regards existing settlements, would be the policy of the Government.

21681. You mean whether any particular existing settlement should be served by the railway or not?—Yes.

21682. Is there any other which occurs to you: would the future settlement of the country be a political one as distinguished from the engineering one?—That is a Government question which the Government would consider, about the present settlement and the future settlement of the country.

21683. That would be within the Government jurisdiction as distinguished from the engineering?—Yes.

21684. Is there any other?—Well, there is; the line for foreign trade would be considered too. Trade with Asia, for instance, that would be a Government question.

21685. Is there any other that might affect the Pacific Railway?—These are the chief things that I can think of.

21686. Imperial interests generally, would not that be a Government question as distinguished from the engineering?—To a certain extent?

21687. To a certain extent; would it not be altogether?—That Imperial interest as relating to a line for foreign commerce. There is the position of the naval station of the Imperial Government, it might be a question, too.

21688. For the Government?—For the Government. But the principal interest would be the through route from England to China; that would be a subject for the Government.

21689. Are there any other subjects which you consider would be Governmental as distinguished from engineering?—No; there is no other comes to my mind now; there may be others.

In his report of 1878, witness recommended a particular line.

21690. In your report of 1878, which you say was ignored to a considerable extent by the Government and by the Chief Engineer, you recommended decidedly a particular line, did you not?—I suggested.

21691. I mean a route?—I did not positively say that would be the best, but I thought it would prove the best.

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21692. I think you said, for the first time, you had offered as an engineer a recommendation of a particular route?—Yes.

21693. Was that based altogether upon subjects which were peculiarly within the duties of an engineer, or did they trespass upon the subjects which you have described as Government subjects?—I think it embraces several subjects. Besides the cost of construction it embraced the extent of the fertile lands that would be taken in by it; these were the two principal objects.

Admits that the recommendation in his report was based on considerations which are outside the province of an engineer, but considers that an engineer cannot close his eyes to the character of the country he crosses.

21694. Upon consideration now, at this date, do you not think that your recommendation of a route was based upon opinions of matters which you have described to be particularly within the jurisdiction of the Government as distinguished from engineering subjects?—Yes; but an engineer, although it is his special duty to get the surface of the country, and matters especially belonging to engineering, he cannot be blind to whether he is going across a good country or a poor one. Incidentally that guides the engineer to a considerable extent.

21695. It guides him to what?—There may be two routes that, as regards the cost of constructing a railway, there may be no difference at all, hardly; but if the one is over a very fertile country and the other over a less fertile one, the engineer would certainly recommend the one over the fertile country.

21696. That would depend altogether on the object of the Government?—I cannot conceive the Government having any better object than developing the riches of the lands.

21697. But if that was not their main object?—I do not know; they may have other objects. It was always understood the Government were anxious to get the best line, and to embrace the greatest extent of fertile lands.

21698. Did you assume, at that time, that you might recommend to the Government a line based on that matter, or were you instructed so to do?—I was not instructed so to do; I merely suggested it, and of course my duty ended there. It was not my duty; if the Government did not take any suggestion, it was none of my business; I had nothing more to do with it. They may have had other reasons besides the one I gave for taking a different course.

Witness pointed out there would have been a good deal more trade.

21699. Would not the future settlement of the country have something to do with the subject from a strictly engineering point of view? For instance, would it not give some indication of the probable trade of the country?—I mentioned that as one of my recommendations, that I expected there would be a great deal more trade over it.

21700. I suppose that in investigating such a subject for the Government an engineer would be guided by views somewhat different from those which would guide an engineer of a private company; I mean that a private railway company would have but one object, that is to gain money, and that the Government might have other objects which would either conflict or unite with that one?—Yes; I conceive that the cost of surveys done for the Government and done for a company would be very different. I will give an example. The second year, in the middle of 1873, within less than two years we had sufficient information to begin and construct a railway across the country. It is possible if a company had been making the surveys they would have begun after one year's surveys; but the Government had the

Railway Location.

whole country in view—the settlement of the whole country—and we were instructed, after finding practicable routes, to survey other routes. They wanted not only to have a practicable route, but to have a knowledge of all feasible routes, and that is one reason why the expense of these surveys have cost so much more than what they would have done if done by a company; but the Government have got an immense amount of information—more than a company would have.

21701. The interests of provinces and even of localities had to be considered?—The Government have a very fair knowledge of the whole Dominion from the international boundary line up to the Peace River; but in the eastern part here, the surveys have not been extended so far, they might have been extended a little further north than they have been—north of Lake Superior I mean. I may state now that the Government have so much information in their possession they could project a line to almost any part of the Dominion in question—that is the Red River westward—with a tolerable certainty as to the probable results along the line projected as to the cost and other matters.

At present Government in possession of so much information they could project a line to almost any point.

Contracts Nos. 41 and 42.

21702. I think you had got down as far as the spring of 1878, upon the last occasion: will you please proceed from that time, describing your operations?—I left Ottawa in 1878, in the month of July. My principal duties during that season were to inspect the works under construction. Between Lake Superior and Red River, an exhaustive instrumental survey was being made, which I directed. They corresponded with me, that is the engineers who were making it. That is the gap between contract Nos. 25 and 15, about 185 miles, I think it is, from English River to Rat Portage.

Surveys.

21703. In connection with this departure of yours in July, I would like you to explain if there was any particular reason why the engineering parties, as a rule, left Ottawa at the time they did in the different years; did it not seem to you that they ought to have left much earlier for field work?—Yes; that is one thing I omitted in stating the various causes of extra expenditure. The parties engaged at a distance, especially in British Columbia, were ordered to come home every year to Ottawa to make their plans. Now, sometimes there were as many as six to ten people coming over, costing $500 each to come and go back again. That alone was a source of considerable expense. The plans could as well have been made in Victoria as in Ottawa. Of course it would have been necessary for me, when the plans were finished, to come to Ottawa and explain them to the Chief Engineer, but if that had been done, the parties remaining in the field, near the work, could have got out much earlier in the spring. There was always a difficulty in getting away from Ottawa in the spring. We might have been six or eight weeks earlier at our work if we could have got away. One thing, the money had to be voted each year for the work, and in fact Parliament was generally prorogued before we could start.

All the engineers need not have been brought each year to Ottawa.

Might have got to work some six weeks earlier could they have got away from Ottawa in time.

21704. Were there positive directions given by the Minister or the Chief Engineer to delay your field operations?—To delay them?

21705. I mean to defer them until the vote should have been taken, or until any other thing should occur?—The parties had to be made up in Ottawa every spring, and we never could get away till the Minister—I suppose the Minister had not time to attend to it during

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the Session. The Session of Parliament was usually over before we could get away.

21706. Do you mean that the office work could have been finished so as to allow the parties to go to field work earlier than they did in the year?—The office work could have been finished as soon in Victoria as in Ottawa, and there they were on the spot. They could have saved the time coming here and going back; that is a month at last. They seldom got out to get to work before June or July, and we could have commenced work in April in British Columbia very well.

Parties seldom got out before June or July, and they could have got to work in April in British Columbia.

21707. What do you say about the field works north of Lake Superior and between Red River and Lake Superior: ought they to have been started each year earlier than they were?—The climate is different there. They could start as early there as in British Columbia. The neighbourhood of Lake Superior, it did not make such a difference in that district.

21708. Then your previous remarks apply particularly to British Columbia?—Yes.

21709. They do not apply to Manitoba and north of Lake Superior?—Not so much. They could not get there until the steamboats commence running.

The delay did not matter for the Manitoba and Lake Superior region.

21710. Then the field operations were not delayed by the absence of the votes except in British Columbia?—Except in British Columbia. I do not know that the vote was the cause of the delay. The work had to be arranged. The work of the season had to be arranged with the Minister before the parties started, and until that was done the vote could not be obtained. We did not know what amount was wanted.

21711. If the person at the head of affairs, whoever it might be, whether the engineer or the Minister, had been able each year to decide earlier, would the works have progressed more rapidly?—Certainly.

21712. Then there has been some delay on account of the absence of that decision?—Yes, and some extra expense.

21713. Has it been material do you consider?—Yes; it would be considerable, and not only the expense, but it destroyed—it prevented works being carried out in that systematic manner that they would have done if the parties had been allowed to remain on the field. Small parties could have gone out on the line in winter or taken notes of climatic effects, the depth of snow, the ice on the different bays and inlets. A great deal more could have been done if it had been done systematically.

Had the work been under the control of a private company it would have proceeded more rapidly.

21714. Do you think if this work had been, from the beginning, under the control of a private company it would have proceeded more rapidly than it did?—Oh, certainly.

21715. And owing to these delays you speak of?—That is one reason. They would not have made so many surveys, but those they did make they would have made systematically.

21716. If a private company had to do as much work as the Government had done in this case, would it, in your opinion, have been facilitated and hastened by the direct control and immediate decision of the parties having the right to decide?—I think so. Some companies

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manage badly; some manage well; but they would have a better chance of doing the work more systematically under the direct control of a company's engineer without any interruptions in winter.

Contracts Nos. 13 and 25.

21717. You say that in July of 1878, you proceeded to the section between Lake Superior and Red River: about what time did you reach the ground?—Oh, I went first to Thunder Bay, I reached that in July; I examined the works on contracts 13 and 25.

In 1878 contract 13 nearly finished.

21718. You gave us some information before upon both those contracts, and you were not then sure whether it was in 1877 or 1878: do you remember now whether you omitted anything?—The works were, of course, further advanced each year. In 1878, contract 13 was very nearly finished when I went out there. In fact it was so nearly finished that the contractors of the next section began to lay the rails over 13.

21719. They had the contract for track-laying and ballasting on section 13?—Yes; I went out on section 25 that year a little beyond Savanne station, some miles beyond it, I do not remember how far. The works were going on steadily. The tunnel had been completed then and I went through it.

21720. Did you enquire into this tunnel question at that time?—No.

21721. Whether it ought to have have been an open cutting or a tunnel?—No; it was all settled on the strength of Mr. Hazlewood's report in Ottawa here. There was no more enquiry about it.

21722. Is there anything that you can mention now which you have omitted upon the subject of either of these sections, 13 and 25?—No; I have already told you what I did with regard to clay embankments that were sliding away. It was in that year that I ordered gravel to be used instead.

21723. I think you mentioned that your object that season was, amongst other things, to ascertain the cause of the great discrepancy between the estimated quantities and the executed quantities, as exhibited in the returns as far as they had been made?—Yes; that was one of the duties that I had to perform.

Main cause of extra cost change in line.

21724. Have you anything to say on that subject, as regards 13 or 25?—Well, what I have stated shows how a considerable extra cost was brought about by the change of location, I think in the tunnel and by the slipping of these embankments; but the main cause was the change of location of the line altogether by which the earth work was very much increased and the rock work decreased. I also examined very carefully into the modes of measuring the work, and I could not find anything wrong; I could not see anything to make me suspect that any improper measurements had been given.

21725. Either intentional or unintentional?—Either intentional or unintentional, I could not see it. My impression then was that the difference arose from the very imperfect surveys made in the first instance, and the quantities in the bills of works that was submitted to contractors when tenders were called for were far too low.

Embankments in some places had shrunk a good deal.

21726. Did you not find on that occasion, 1878, that many of the embankments had, from shrinkage, become much smaller, that they had become too low and too narrow, and required material to be added to them?—Yes, they were in some places. There had not been a

Contracts Nos. 13 and 25.

sufficient allowance made for shrinkage of the embankments. All embankments, of whatever sort of earth except gravel, embankments have to be made considerably wider than the necessary size: they waste away and slip down and shrink and become narrower.

21727. I believe you made a full report upon that subject to the Department?—I think so. There had not been a sufficient allowance made for shrinkage.

21728. Is there anything further about either of these sections, 13 or 25?—No; of course there were differences between the contractors and engineers about the specification of rock. There are always disputes about what is loose rock: it is a very fertile source of misunderstandings.

Railway Location and Construction—Contract No. 15.

21729. Then, after leaving contract 25, what course did you take?—I went across then by the Dawson route in a canoe to Rat Portage and I walked over the whole of section 15, examining the works very carefully. Mr. Carre was with me. I took very copious notes of the state of the works of what I thought was required in different places. I suggested some changes—slight changes—in the location of the line by which the cost of construction was very much reduced. I also ordered more cross-sections to be taken in view of making other changes. These changes that I made on the spot were those which were apparent to the eye that it would be a great improvement. There were other places where I could not tell whether I could improve the line by altering it until I had cross-sections made. I also found that in crossing several water filled valleys—narrow lakes you may call them—that the engineers had not sufficient information with regard to the depth of water and the depth of mud and the shape of the rock at the bottom of these lakes—the inclination of the rock I should say.

Suggested slight changes in location by which cost was reduced.

21730. Did you take any steps towards supplying them with that information?—The moment I got within reach of the telegraph, I telegraphed to Ottawa to have a set of boring tools made as quickly as possible and sent out to get that information which I thought was deficient.

21731. Did you find that the work had been well laid out, the location a fair one: what was your opinion of the engineering works that had been done at that time on section 15?—On the whole the location was not bad. I made some improvements in it as I say, but it is a very rough country, and I do not know that it could have been made much better, and at the same time keep the grades that Mr. Fleming required. The principal complaint I had was with regard to crossing these lakes, that I could not decide what sort of structure to put up, which would be the most economical, the solid embankment, trestle bridge, or any other kind of structure, until I had better information as to the depth of mud and the inclination of rock at the bottom.

On the whole location not bad.

21732. There has been a vexed question and one much discussed about the change in the character of the works, but that has lost its importance since it has been adopted by Order-in-Council; but there is another matter connected with it which I wish to ask you about: whether you understood that there was any difficulty in a contractor carrying out the work as it was originally desired, I mean on account of the extremely irregular surface of the country? It has been suggested here, both by the contractor and by an engineer, that it would be difficult for any contractor to have fulfilled the contract in the way

Railway Location and Construction—Contract No. 15.

it was originally laid out: have you any idea about it?—I suppose what you mean by originally laid out is the last way.

Great difficulty in getting timber required by the original contract, and also the difficulty in getting the material from cuttings to where it was required.

21733. I mean the way intended at the time of the contract?—Yes; there was a great difficulty in the first place in getting timber for such structures as would be required. There was no timber in the country large enough or long enough. There were other difficulties in the contractor getting the material from certain cuttings forward to where it was required to be deposited.

21734. That is the difficulty which I was alluding to, not the timber trouble, because that has been overcome by the Order-in-Council; but as to this one, what would you say about that?—There was a case laid me before at Winnipeg, and I made some slight alterations in the grade, and filled up where there would be some low trestle work, probably some six feet high or something of that sort, which would have to be erected before the contractor could get his material forward. I turned that into embankment and that facilitated the work a great deal. The cost would be slightly more than as was originally intended.

21735. It was originally intended, when I say originally, I mean at the time of this contract being closed, that most of those gaps should be filled with trestle?—Just so.

Some portions could not have been done as originally intended.

21736. Could it have been accomplished in that way, in any reasonable time by the contractor?—Well, a great part of it could have been done very well, but in crossing some of those deep gullies filled with water and mud, the principal difficulty in construction would be the foundations. It is shelving rock covered over with soft mud—mere slush. I cannot see that piles could have been made to hold, and it was a puzzle to know what to do with it, until they had further information. I do not think it could have been done as originally intended, some portions of it.

21737. I think it was designed that those water stretches should be filled in with rock, either solid foundations or protection walls?—It was intended it should be all bridged with trestle work, where there were some cuttings—in some of those gullies there were cuttings of rock on each side, and it was intended that that rock should be put in to a certain height—up to water level.

21738. Whenever there was to be a rock basis, it was to be above water level, was it not?—Yes. When we ascertained approximately the depth of some of those places, we found it would take an enormous quantity of rock, more than could be taken out of the cuttings—that we would have to borrow rock, as it is called, to fill up to level. We overcame that difficulty by simply forming rock embankments on each side—two rock embankments instead of one—about six feet wide on the top, and filling in between with earth, and then putting the piles upon that.

21739. Piles upon the earth?—Into the earth or trestle on that embankment.

Comparison of trestle and embankment.

21740. But was that any gain; would not those two protection walls take just as much rock for the bases as if you had had a solid basis for trestle?—No; not near so much.

21741. What would be the width required for trestle?—It depends on the height.

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21742. Of trestle work?—Yes; the trestle work may be fifteen feet on the top, and the outside posts are raking.

21743. Well, take a twenty foot trestle; what would be the base required for the foundation?—If the raking of the post at each side of the trestle were two inches in a foot, that would be four inches additional for each foot in depth, so a trestle work twenty feet high would require six feet eight inches more at the top.

21744. And what shoulder or berm, supposing you were having a rock basis outside of the slope of the trestle?—A couple of feet would be sufficient for the sill in which the post is morticed into. We leave it a foot at least outside of the raking post, and say two feet extra would be quite sufficient in rock.

21745. That would be eight feet eight inches altogether?—Yes.

21746. Now what is the width of each protection wall?—From four to six feet.

Some trestles sixty feet.

21747. Well, you have to double that besides the slope: don't you think that would take as much rock?—What we are speaking of in trestle is of far greater depth than twenty feet. There are trestles of sixty feet.

21748. Those are the ones that were the formidable obstacles?—Yes; a great bridge at the bottom.

21749. Did that happen at more than one place?—Yes, it happened at several places. There were several of them pretty near sixty feet high above the water. I think Cross Lake is about that height. I am speaking from memory—somewhere about that.

21750. Then these rock protection walls in these deep cuttings would require very much less material than the original plan of a solid base for the trestle work?—Certainly.

21751. And the scarcity of rock was one of the difficulties to be overcome?—There was plenty of rock, but it cost a great deal to move it. We wanted to use as little rock as possible on account of the great cost of moving it.

In some places owing to shape of the country difficulty in getting material.

21752. But in addition to that there was a difficulty in getting the material on account of the shape of the country: that it had to be taken by what are called tote roads around the water fillings?—In some places there were difficulties of that sort; other places again there was plenty of rock close at hand.

21753. Do you remember whether, upon this trip and on this visit to section 15, there was any discussion as to the feasibility of a better line crossing Cross Lake?—I do not remember my attention being specially called to it; it may have been. There was no written report on it submitted to me.

21754. You travelled over the line yourself?—I travelled over it, and it may have been discussed at the time. There was very little room, very little chance of making much improvement between Cross Lake and the junction with 14.

21755. At the time of that visit the work was not progressing there?—Oh, yes. I think the cutting was taken out on the

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out on the east bank of the lake; in fact on both banks, the rock was partly taken out——

The crossing about the best which could be found on Cross Lake.

21756. That had happened between your previous visit in 1877 and this visit?—Yes; there could not have been much improvement even if the work had not been carried up to that point. The crossing there on that high level is about the best that can be found on Cross Lake. It is after the lake is crossed, extending over about a mile, that any deviation could be made from the present line.

21757. Which side of the lake?—The west side of the lake where it joins section 14. Any improvement that could have been made there would have been very trifling.

21758. Are you at all familiar with what is known as the Forrest line —the Forrest location—not the adopted line, but one suggested by Mr. Forrest?—No; I do not remember it.

Any improvement would have had to be made on 14.

21759. I understand you to give an opinion now that there was no improvement to be made covering any portion of section 15, that if the line was susceptible of any improvement it was on the west side of Cross Lake?—It was on the west side of Cross Lake on 14, all on 14.

21760. Do you think that the line was not susceptible of any improvement at a distance further east than that, so as to embrace parts of section 14 and section 15, or have you given that subject any consideration?—You could not have embraced 15, because I say the crossing of the lake was the best that could be got, so you could not alter 15.

21761. How do you come to conclude that that was the best crossing?—From the width of it and the neighbourhood; it is the narrowest crossing.

21762. Is the width the only thing to be considered?—If the depth is the same, it is.

21763. But perhaps the depth is not the same: are you aware whether any investigation has taken place so as to arrive at a conclusion which was the best place for crossing Cross Lake?—I do not know that any surveys had been made. I am not aware of any.

21764. What is your reason for supposing that the present is the best crossing?—It appeared the best site for the grades that have been given—twenty-six feet to the mile.

21765. In connection with the crossing at this adopted point, of course the filling of the bay just beyond it was involved, although it was a part of section 14?—Yes.

The expense of filling the bay considered, but to deviate south would have involved a four degree curve.

21766. Had not that filling any bearing on the subject, so as to make you consider whether a better crossing for all purposes could not be found a little further south or in some other spot?—Of course the expense of filling that bay was taken into consideration, and there was some proposal to try and lessen that by commencing the deviation immediately at the junction of 15 and 14, and curving away further south. That would have involved a four-degree curve, which was not considered desirable at that point, entering on that bridge. It was not fully determined what would be the character of structure across that lake at that time.

21767. That four degree curve which you say was objectionable would have been unnecessary if the deviation had commenced on section

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15, further east than the junction with section 14 ?—It would not have been necessary according to the line which I see laid down on the map, but I never saw any survey of that line nor any profile. It never was brought to my notice.

21768. It is a moral certainty, is it not, that that curve would not have been necessary if a deviation could have been found feasible east of the point which would have lessened the curve?—That would have lessened the curve certainly.

The question whether a railway constructed on line suggested would have cost less than one on the located line, not taken up by witness in 1878.

21769. So the real question is whether a point of deviation could have been obtained further east upon section 15 ?—The question is whether a railway constructed on the line suggested would have cost less than on the located line. That would have been only ascertained by surveys.

21770. That question was not taken up by you upon the occasion of your visit in 1878 ?—No ; it was not.

21771. Was the character of the country at the east end of section 14 very similar to that of the west end of section 15?—Yes, very similar.

21772. For what distance on section 14?—I think about a mile, probably a little more. I think very nearly to the stream that goes into the lake about a mile and a-half back.

On 14 after about a mile the country generally prairie.

21773. And about the rest of section 14, was that over a similar country?—It was different. There were rocks, but there were spaces between the rock. The line generally ran on what might be called a prairie country.

Thinks the terminus selected between 14 and 15 not fortunate.

21774. Do you think the selection of the terminus was a fortunate or a desirable one as an engineering decision?—I think it was not fortunate. The thing had probably been overlooked that a different kind of plant, much more expensive plant, was required to do the work on section 15 than on 14, and it would have been better to have kept all the work of a similar kind on one section.

21775. And that would have embraced, as I understand you, about a mile and a-half of section 14 ?—Yes.

21776. Had the contractors for section 14 plant necessary to do that kind of work?—They had not.

21777. How was it accomplished ?—An arrangement was made between the contractors for section 14 and Mr. Whitehead, contractor for section 15, for the latter to do the work with his plant.

Arrangement made by contractor with Whitehead.

21778. Did that arrangement require the consent of any person acting on behalf of the Government to make it a binding one?—It would not have required it only for one thing, that Mr. Whitehead made it a condition that he was to be paid directly by the Government for doing it.

21779. Did you take part in the arrangement?—Yes ; an arrangement was made while I was there. There was a good deal of discussion about it, and I think, I am not sure if I did not send a copy of it to the Government—to the Department—and suggesting it appeared to me to be the only means of getting that portion of the work done. I think there was another reason why the Government had to be consulted : it was regarding the price of doing it. In Sifton & Ward's contract there

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were certain extra allowances made after a certain amount of haul—after every 100 feet—beyond that there was an increase in the price.

21780. And the material for this work had to be carried a long distance from the borrowing-pit?—Yes; and if I recollect right there was no limitation to that increase.

21781. Not in the contract for section 14?—That would have made the price come excessively high for them to do that work.

21782. It would have become a question whether the Government would allow that to be done under the contract or not?—Just so. Mr. Whitehead proposed to do it at certain prices, much lower than if made out according to Sifton, Ward & Co.'s contract.

Under arrangement with Whitehead, better for Government than if it was done by Sifton & Ward.

21783. Do you mean the price would have been much lower to the Government?—Yes; under the arrangements with Mr. Whitehead it was more economical for the Government; it was better for the Government than if made under Sifton, Ward & Co.'s contract.

21784. Then, do you understand the Government was to pay this new price to Mr. Whitehead?—I think so.

21785. That was the substance of the arrangements?—Yes.

21786. Well, if that were so, do you understand that the Government were not liable to pay Sifton, Ward & Co. the whole price as it would have been if they had done the work without any change in the arrangement?—That is a legal question which I do not know that I am competent to answer.

Witness's impression that Sifton, Ward & Co. surrendered all claim to the portion of work given to Whitehead.

21787. Do you remember whether that point was distinctly decided at the time when you took part in the arrangement?—My impression is that Sifton, Ward & Co. surrendered all claim to that portion—simply turned it over to Mr. Whitehead to finish for them.

21788. You mentioned, upon a former occasion, that this grade had to be raised upon section 14, at the eastern end, in order to coincide with section 15?—Yes.

21789. How was it that was not laid out in that way originally?—There was not much alteration there. I suppose there had been some slight changes in the line, or the drawing in of the grades. The line might be the same, and the grades were probably down on section 14. If they were drawn in before section 15 was surveyed, it would be found that they would not coincide with each other, consequently there would have to be some change in one or the other.

21790. If the change could have been made upon one or the other it would seem to have been better to have made it on section 15 so as to have lowered it: would that have had the effect of raising the grade to too great a maximum—is that why it was retained on section 15 and raised on section 14?—I cannot answer the question distinctly now: it depends on the consideration of the whole of the profiles.

Raising the surface at the east end of section 14 increased the quantities a little but not much.

21791. This raising of the surface at east end of section 14 has been mentioned to us as one of the reasons why the quantities on section 14 exceeded the estimate, and I wished to know if you considered that an indispensable thing or a matter of choice?—It increased the quantities a little, but not much. I cannot say what the increase was now, but I gave it to a Committee of the House two years ago. It was not much.

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21792. It would not have a serious effect on the discrepancy between the estimated quantities and the actual quantities?—No; it was a small quantity. The great discrepancies on that line, so far as I could find out, arose from the change of location into more swampy ground than the original line, and the surveys having been made in winter that no allowance was made for the sinking down of the embankment in the mossy covering of the muskegs. I paid very great attention to the measurements on that section. I felt satisfied in my own mind that the measurements were correct.

21793. You mean on section 14?—On 14.

In 1878 went over section 14.

21794. Well, you have described your trip to section 15 in 1878: did you still proceed westerly and go over section 14, in 1878?—Yes; I went over 14. I walked over a portion of it and the rest of the distance I went in a hand-car. They had the rails laid on a considerable portion of it at that time.

21795. And how long did you remain up in that part of the country in 1878?—Oh, I went home as soon as I got through with the examination of 14. It was getting late in the season then—about the end of September I suppose.

21796. Returned to Ottawa?—Returned to Ottawa.

During 1878, acting Engineer-in-Chief in the absence of Fleming, who returned to England again in summer of 1878.

21797. And during the season of 1878 were you Engineer-in-Chief, or in what capacity were you doing the work?—I was acting Engineer-in-Chief, as on former occasions, in the absence of Mr. Fleming.

21798. Mr. Fleming had returned to England again in the summer of 1878?—Yes.

21799. Do you remember when he came back to Canada?—I think it was in November of the same year.

21800. Then up to November, 1878, you remained acting Engineer-in Chief?—I did.

Contract No. 42. Getting out bill of works.

21801. After you returned to Ottawa at the time you describe was there any particular matter which occupied you?—I was engaged principally superintending the getting out the quantities for the bill of works for that gap of 185 miles between sections 25 and 15 which had been surveyed during the season. They are called sections A B and C, contracts 41 and 42. That was my principal business that winter. I also gave instructions in two or three cases with regard to the works on section 15, with regard to crossing some of these lakes, after consulting Mr. Fleming. Of course I consulted Mr. Fleming when he returned, but he asked me if I would continue to still take an interest in that work. He was very busy with other matters, and I attended to several matters connected with the construction, during the winter up to the spring of 1879, when I had nothing more to do with it.

Railway Location—Line west of Red River.

21802. Then, in the spring of 1879, what position did you take?—I was sent out then to examine the country between the Red River and the South Saskatchewan, and transversely between the Assineboine and the Riding and Duck Mountains, with a view of changing the location of the line to the south of Lake Manitoba.

21803. You were in charge of the surveys in that district?—Yes; I had two surveying parties. One of them was engaged entirely in the Province of Manitoba. The other was in the North-Western Territories beyond the boundary of Manitoba.

Railway Location—Line west of Red River.

21804. Your operations, I think, are described in your report: in the report of Mr. Fleming of 1880?—Yes.

21805. Who were the engineers under you taking charge of these two separate surveys?—Mr. Murdoch had charge of the survey through the Province of Manitoba. Mr. Barclay had charge of the other party working westward of that.

Contract No. 48.

21806. Are there any matters connected with the season's operations of 1879 which call for more explanation than you have given, either in your report or in your previous evidence?—There were two lines of the second 100 miles. The first 100 miles was pretty well decided, and determined, the location of it, up to the western boundary of the Province of Manitoba. From that point we surveyed two lines, one going very near to Rapid City, to the Assineboine Valley up to Bird Tail Creek, and thence up to Fort Ellice to the mouth of the Qu'Appelle, three miles north of Fort Ellice, that was one line. Another line took a more northerly or north-westerly direction and crossed the Little Saskatchewan near Tanner's Crossing where the town plot of Odanah has since been laid out, and after crossing that valley it continued still in the north-western direction near Long Lake, and striking the valley of the Bird Tail pretty well up towards the Riding Mountain, very near the Indian reservation across the valley there. The 100 miles ended

Contract No. 66.

just on the west side of the valley on that line. The other line was about 110 miles from the boundary of Manitoba to the mouth of the Qu'Appelle. The more northerly line—I believe it is called the north-western line in the report—was the best. The worst gradient that it had going eastward was about forty-four feet to the mile, if I recollect right; that is in the valley of the Little Saskatchewan and Bird Tail, but the season closed before the surveys could be continued further. There were some detached surveys made beyond the Bird Tail near Shell River, but the season closed before we could continue the surveys across the Assineboine, and that left a doubt whether we could extend that north-western line without more expense. It was, nevertheless, adopted that north-western line, by the Government. There was a certain portion of it, the east end of it, that was common to both lines, and the contractors when they commenced that work in 1880 had work to go on with, and we had time to extend the survey westward that had been left the previous year.

21807. The contractors, Bowie & McNaughton, commenced at the east end?—Yes.

Kept ahead of contractors

21808. And you were able to keep ahead of them?—Yes; they worked on that part common to both lines. In fact they had not finished up to that portion where the two lines separated, when we had our survey completed to the Assineboine, and in fact the third 100 miles and part of the fourth 100 miles, and a new line was found between the two that had been surveyed in 1879. That was finished only very lately; within this last month—the profile I mean, the plan.

21809. Then did you return to Ottawa in the fall of 1879?—Yes; I returned to Ottawa.

21810. I suppose doing office work connected with that year's operations?—Doing office work. We had the profiles and plans to make of the two lines surveyed and the quantities to get out of the two lines and the comparative cost of the two.

Railway Location.

21811. Then in the spring of 1880?—I went out again to continue the surveys as I have just described—to continue the surveys westward. Went out again in 1880 to continue surveys westward.

21812. I suppose you continued that up to June, 1880; we do not want to ask what happened after that?—Continued up to November, 1880.

21813. Is there any matter connected with this survey which you have described, either in 1879 or 1880, which you consider material, over and above what you have stated by way of evidence or is to be found in your report?—Nothing more; the survey turned out very satisfactory. It had always been assumed it was impracticable to get a line across these deep valleys. We did succeed in getting a very good line. We had to use gradients of one in 100 for short lengths both ways. That was the only objection to it in comparison with the original line.

21814. It was no longer considered necessary at that time to adhere to the gradients which Mr. Fleming had maintained between Thunder Bay and Red River?—We should have retained them if we could, but we could not do so in that country without enormous expense, and the country is a very much better country for a railway or settlement.

21815. I understood that the Government had adopted the policy of building a cheaper road with steeper gradients as being suitable to the requirements of that locality?—The railway in every respect, with the exception of that of gradients, and that occurs in only two places, is equal to any other portion of the line. It is equal to the principal lines in Ontario—equal to the Great Western or Grand Trunk or Intercolonial. They have steeper gradients than that and they are considered first-class lines. Line located west of Red River equal to the principal lines in Ontario.

21816. Then it is not a very degraded line?—It is a first-class line, with really very few curves and very light work. It is a much better line than either that was found in 1879—the one that was found in 1880. A first-class line

21817. Is there anything further connected with that section of country—I mean the railway through it?—I forgot that it came within my duties to examine, in 1879, the crossing of Red River. A point for bridging Red River was agitated then. I went down with Mr. Murdoch, travelled from Winnipeg down the river. We examined several points, and I came to the conclusion that the best place for building it was near the Stone Fort, and I reported accordingly—a very short report. Reported in favour of the Stone Fort as a site for a bridge across Red River.

21818. I suppose that was upon the merits of the question irrespective of the steps which had been previously adopted, such as the crossing at Selkirk or any other matter, and as if the question was perfectly free?—There was nothing done towards the bridge at Selkirk and I considered the question free, an open question, where the bridge should be.

21819. That would have necessitated a divergence from some portion of section 14?—Very little; it almost came into the station—the east end of Selkirk station. About two miles back from the river on section 14, the line takes a bend to the north-westward. The line produced across by the Stone Fort would strike that bend probably about two miles from the river, may be three—two and a-half or something of that sort.

Railway Location.

The adoption of Stone Fort as a crossing would not have necessitated abandoning any great length of section 14.

21820. Then the adoption of the crossing at Stone Fort would not, at that time, have necessitated the abandonment of any great length of section 14?—No, not very; a mile I should say—a mile and a-half at furthest, possibly two miles.

21821. Was it before much work had been done upon the first 100 miles west of Winnipeg, that you made that recommendation?—There was none of the work done on the first 100 miles. There was a part of the branch from Winnipeg northward, which was commenced.

21822. On the west side of the river?—On the west side of the river; but there was none of the main line done west of the Red River.

Nor at that time was there any difficulty on account of what was done west of Red River.

21823. At that time there was no difficulty on account of what was done west of Red River?—Nothing.

21824. And as you describe, very little east of the river?—Very little east of the river.

21825. Do you say you made that report in 1879?—I made it in Winnipeg, and gave it to Mr. Fleming in 1879. He was coming to Winnipeg, and I left it for him there.

21826. Have you ever spoken to him on the subject since?—No; it has never been discussed.

21827. I believe he made a report on that subject about that time, or shortly afterwards, which is printed?—Yes; I saw a portion of that report in a newspaper. I do not know that I have ever seen it in any other form.

21828. Is this report of which you speak, as having been made by yourself, published in any of the printed reports?—I have never seen it; I do not think it is. It was a very brief report, not over two or three pages of foolscap probably.

21829. Is there any other matter connected with any of your operations that you think requires explanation, or which you would wish to add to your previous evidence?—No. I cannot recall anything at present.

OTTAWA, Saturday, 7th May, 1881.

SMELLIE.

W. B. SMELLIE's examination continued:

Railway Construction—Contract No. 25.

By the Chairman:—

21830. Were you in the employ of the Department of Public Works at the time that the tunnel was decided upon on section 25?—Yes, I was.

21831. Were you familiar with the correspondence and matters which led to the decision of making the tunnel?—Yes.

Correspondence with reference to tunnel.

21832. Can you produce any letters, or copies of any letters, on the subject?—I produce a communication dated the 27th of September, 1876, enclosing communications from Mr. Hazlewood, who was the district engineer, and from Mr. Marcus Smith, who was the acting Chief Engineer at that time, explaining the matter. (Exhibit No. 301.)

21833. In whose handwriting is this memorandum which is attached to these papers?—That is the Hon. Mr. Mackenzie's.

Railway Construction—Contract No. 25.

21834. This is dated 4th of October, 1876: was it decided at that time to build this tunnel at $9 a yard?—I produce a copy of a letter written by the Secretary of the Department to Mr. Hazlewood, dated 5th of October, 1876, from which it appears the work was then decided upon. (Exhibit No. 302.)

21835. Were any plans submitted to the Department about the time of these letters from Mr. Hazlewood?—There were. I produce them, three sheets. (Exhibits Nos. 303, 304, 305.)

21836. Have you any subsequent correspondence upon this subject which you can produce?—The next paper I produce is a telegram from Mr. Hazlewood, dated 6th of October, attached to copies of telegrams sent to Mr. Hazlewood. One is dated 30th of September, 1876, and the other is 6th of October, 1876 (Exhibit No. 306); also copy of telegram from Mr. Hazlewood, dated 18th of October, 1876 (Exhibit No. 307); also letter to the Department from Mr. Smith, dated 23rd of October, 1876, enclosing copy of a letter from Mr. Hazlewood, dated 17th of October, 1876 (Exhibit No. 308); and copy of a letter written by Mr. Smith to Mr. Hazlewood, dated 21st of October, 1876 (Exhibit No. 309.)

21837. This is a letter in the name of Mr. Smith, and appears to have been signed by you for him: was it under his immediate direction, or was it done in his absence?—It was done in his absence. The next communication is a letter written by myself in the absence of the Chief Engineer, addressed to the Secretary of the Department, dated 11th July, 1877, enclosing copy of a letter written by Mr. Smith to myself on the same subject, dated 26th June, 1877. (Exhibit No. 310.) The next in order is a letter written by the Secretary of the Department addressed to myself, dated 29th August, 1877, in which the price to be paid per yard for the tunnel is fixed (Exhibit No. 311); and a letter closing the matter written by myself to Mr. Hazlewood, dated 30th August, 1877, conveying to him the rate as fixed by the Department. (Exhibit No. 312.)

Letter from Secretary of Department fixing price per yard to be paid for tunnel.

21838. Did you take any part in the negotiations between either of the contractors and the Government connected with this subject?—No.

21839. Neither directly nor indirectly?—Neither.

21840. Has the necessity or the expediency of this tunnel been a matter of consideration in the Department—I mean the engineering branch of it in which you are placed—beyond what appears by these letters?—Nothing but what appears in these letters.

OTTAWA, Friday, 13th May, 1881.

SANDFORD FLEMING'S examination continued:

FLEMING.

By the Chairman:—

Contract No. 14.

21841. The evidence given up to this time upon the subject shows that there was by the contract no maximum distance for which haulage price should be paid upon section 14, and the specifications support that view: can you say why it was that there was no maximum limit fixed?—My explanation of that clause in the contract is simply this: in previous specifications we had allowed haul on every 100 feet, and we invited the contractor to say what price he would put on the haul.

Explains how there was no maximum limit for haul.

Railway Construction—Contract No. 14.

That led to a good many difficulties. In the first place the computing of haul as the work went on was extremely complicated, and I decided to leave out haul in ordinary cases, and all ordinary cases may be considered to be under 1,200 feet. It was provided no price should be paid for haul in all cases under 1,200 feet. It appeared to me to be a hardship on the contractor to compel him to haul any distance over 1,200 feet—any considerable distance—and not pay him a reasonable price for it. One cent, to my mind, might be considered a reasonable price for haulage by carts for any reasonably short distance over 1,200 feet, and in case of their being a longer haul, which I did not contemplate in this case or any case at that time, it would have to be done by train and another arrangement would be entered into; but in no case did I expect there would be any haul over half a-mile when that specification was drawn.

Did not contemplate a longer haul than half a mile.

21842. You say that you did not contemplate a longer haul than half a-mile, which is somewhere about 2,500 feet, I suppose?—Yes.

In the case of this contract not thought necessary to put in maximum price for haul.

21843. But I am asking why the condition that there should be no price beyond that length was not put in the specification; in other words, that there should be a maximum price—because, as I understand, there has been such a condition put in subsequent contracts?—I can only say it was not thought necessary. Subsequently it was thought necessary, and it was put in specifications after that date.

21844. Could you say now whether, in other places and upon other lines, it is usual to put a maximum price for haulage?—Well, different plans are adopted. The plan that I have most commonly seen adopted is to pay for every 100 feet of haul.

Maximum haul limited to 2,500 feet because contractors showed a tendency to have long hauls where they had a good price.

21845. Then the condition which was subsequently adopted is, as I understand you, an exceptional condition in specifications for railway work: I refer to the condition that there shall be no haul paid for over 2,500 feet, or over some fixed distance?—It was found there was a tendency on the part of the contractor to have a haul exceeding 2,500 feet if his price was a good one for haul, and in the interest of the public it was deemed expedient in specifications which were subsequently prepared to limit the haul.

21846. I suppose that in fact the proprietors, the Government in this case, would always have the control of haul by permitting the engineer to direct the contractor from what place he should take the earth or excavated material?—The power is left in the engineer to say where the material is to be had, and it would be quite unreasonable on his part to permit a long haul if the material could be had in a short distance.

As a fact, contractor limited by the power of engineer.

21847. So I understand you to suggest that although it was not mentioned in the specifications that the contractor should be limited in his price, that he was in reality limited by the power of the engineer?—He was clearly limited by the power left in the engineer's hands.

21848. In directing from what point the material should be moved?—Yes. You can quite understand, if the contractor's price for haul was a good one, it would be simply absurd for him to haul material from one end of the section to the other. It would be absurd on the part of the engineer to allow him to do so when material could be got within one mile of the spot where it was needed to haul it twenty-five or thirty miles perhaps.

Railway Construction—Contract No. 14.

21849. Then the wording of the condition on this subject in subsequent specifications was, in effect, making it a positive arrangement instead of one depending on the discretion of the engineer?—Yes.

Limit to haul put in subsequent specifications; reason for this.

21850. And that was the only difference, fixing it in the specification or leaving it to the engineer?—It was sometimes found the assistant engineers were not familiar with the Chief Engineer's mode of doing the work, and might mistake his meaning; and it was deemed advisable, to prevent any mistake of that kind, to put in a limit to the haul in subsequent specifications.

21851. You have alluded to the haulage being made sometimes by ordinary carts and sometimes by train: do you know how the principal haulage from borrowing-pits took place on contract No. 14—I think it is mainly at the east end of it?—The ordinary course on work of that kind is to use horses and carts, unless the quantity moved is very large. If the quantity is so large as to warrant the employment of engine power, then engine power is used if the contractor has sufficient resources to purchase it.

Large filling at end of 14 done by engine power.

21852. Do you remember how it was done in this case—section 14; I believe the work was principally at the east end of it?—Yes; the large filling at the east end of 14 was done by engine power.

21853. Could you say whether it was the distance beyond the 2,500 feet which is mentioned in other contracts?—I think the material was hauled for a considerable distance. I cannot mention the number of miles, but if I had the plans here I dare say I could do it. As far as I remember, the distance between the borrowing-pit and the embankment is about two miles.

21854. That would be somewhere about four times the limit of the maximum haulage which is provided for in subsequent contracts?—I had nothing to do with the making of the arrangement with Mr. Whitehead for doing that work, as the substituted contractor. I can only say: if the original contractors had done the work, and it was impossible to get the material from any other point than the point two miles distant from the filling, they would be entitled, under the contract, to be paid for it—to be paid for the haul for that distance; but I am not prepared to say that the material could not be had nearer than two miles distant. I have no doubt that a borrow-pit two miles away from the filling was selected by Mr. Whitehead for other reasons.

Purchase of Rails—Contracts Nos. 6-11.

21855. I have not asked these questions with any view to enquiring into the claim made by Sifton, Ward & Co., the original contractors, but only to ascertain what care had been taken on the part of the Engineering Department to provide for different contingencies, and I will now proceed to another subject, which is the purchase of the steel rails. I think you said that you offered your views to the Minister upon that subject, because you considered them justified, in consequence of communications you had received from England, and particularly from Mr. Sandberg: could you say whether these communications were to you individually or officially?—According to my recollection, there were letters received from Mr. Sandberg—letters which might either be called private or official. I cannot find them; I do not think they were marked private, and yet they were not written in a very formal manner.

Purchase of Rails—Contracts Nos. 6-11.

Cannot find the letters of Sandberg, suggesting the purchase of steel rails.

21856. Do you think there were several?—I think there were more than one—there were several letters. I have made enquiry for those letters but they cannot be found. I thought I had left them in the office. I have asked my old secretary, Mr. Burpe, to try and find them, and he informs me that they cannot be found, and my impression now is that while the matter was discussed in the House of Commons, I may have handed those letters to Mr. Mackenzie, and he may not have returned them, but that is mere surmise. I think it is quite likely, however.

Thinks he also had letters from Livesey

21857. Do you remember any communications from other persons on the same subject and to the same effect whose names you can give?—No; but I understood from Mr. Mackenzie that he had made enquiry of other parties to the same effect, namely, that it was considered by them a suitable time for purchasing rails. I said "No;" but I am not quite sure that I am correct in saying no. I think I had also letters from a Mr. Livesey, of London, about that time.

21858. Who was Mr. Livesey?—Mr. James Livesey was, and still is, in the engineering business, and it was part of his business to inspect rails and secure the purchase of rails, and had in fact done so before for myself.

21859. Was he then a commission agent for the purpose of making purchases?—No; he was a general engineer in practice in London.

21860. Have you asked for the letters from Mr. Livesey, if there are any?—Well, I have made no enquiry for them. Not having found Mr. Sandberg's I considered that Mr. Livesey's may have gone the same way.

Recollection at fault, Sandberg's letters must have been received in summer of 1874.

21861. You produced, upon a former occasion, a diagram published by Mr. Sandberg, showing the fluctuations in the price of rails: would you please look at it and say for how long after the purchase the price continued to fall, and how low it fell?—A diagram similar to this, I think, was sent in those letters referred to by Mr. Sandberg, showing the fluctuating price of rails up to that date. That was the midsummer of 1875, if I remember right. Looking at the diagram and the advertisement for rails I find that my recollection is not strictly correct with regard to the dates—that the letters received from Mr. Sandberg must have been in midsummer, in the summer of 1874, as the advertisement is dated September 29th, 1874, and in the summer of 1874 the price of rails had fallen to £10 5s. sterling per ton.

21862. According to the diagram?—According to this diagram. They appear to have remained at that price from the last quarter of 1874 until in midsummer of 1785, some seven or eight months—six or eight months; then the price began to fall and continued falling with very slight intermissions until midsummer of 1879, when the price reached a maximum figure of £4 10s. per ton. Then, acccording to the diagram before me, the price again began to ascend, and it is now about the same price as in 1874 and 1875.

21863. I understand you to say, broadly, that your recommendation to Mr. Mackenzie to make the purchase was based upon the idea that rails had then reached the lowest price that they were likely to reach?—If my recollection is in any way correct that is the positive opinion of Mr. Sandberg.

Purchase of Rails—Contracts Nos. 6-11.

21864. And your recommendation was based upon a similar opinion?—Yes; and my opinion was based upon similar information.

Had he known rails would have gone down to the minimum they reached afterwards he would not have recommended the purchase of rails at that time, at least, not to any very great amount.

21865. If you had foreseen at that time that the price could go down to the minimum price which you say it has since reached, would you then have recommended the purchase of rails at that time?—I certainly would not—at least, to any great amount.

21866. I think I understood you to say, upon a former occasion, that it was the opinion of Mr. Sandberg and of yourself, from his letters and from what you knew of the subject, that the rails could not be made or furnished at a much lower price than they were then offered for?—He said to me that it was the general opinion of rail makers that the price of rails had certainly reached bottom.

Impression from the correspondence with Sandberg that rails could not be manufactured for less than the price to which they had then fallen.

21867. And had not only reached bottom, as I understand you, but could not be manufactured for less?—And that they could not be manufactured for a great deal less without loss to the manufacturers.

21868. That it was not a question of comparative profit to the manufacturers, but that they could not be made to sell at a lower price?—Yes; that is my impression of the correspondence.

21869. And of the groundwork of the opinion?—Yes.

21870. Can you say now, or have you given any such attention to the subject as would enable you to explain how it is that they have, notwithstanding that idea, been made and furnished as low as £4 10s.?—Well, I have heard rail makers say they have lost money by it, by supplying rails at that price.

How for some years manufacturers of rails came to sell them at a lower price than in 1874.

21871. Do you think, from the fall of 1874 to the summer of 1879, that the rail manufacturers would go on continually supplying rails at a loss for four or five years?—Well, there may have been various circumstances which enabled or compelled them to go on manufacturing and selling rails at lower prices than in 1874. First, they may have found a cheaper way of making rails, and again, they may have found it in their interest rather to keep their shops open and the men employed, even if they lost money, than to close their shops and let the men scatter.

21872. You say that this may have happened: what I intended to ask was whether you had given sufficient consideration to explain how it has happened that the price has been lowered?—These are the reasons furnished me by rail makers themselves when in England.

21873. The reasons that you mention are not altogether consistent, as I understand it, but perhaps I am not right. You have given two reasons so far: first, that they have found a cheaper way of making the rails, rendering it possible to manufacture them without loss at a much lower price; the other, that they have suffered loss, but that they continued manufacturing in order to keep their establishments open?—I do not see any inconsistency there. They may have saved in one end and lost on the other. The economy in the production of rails may have had the effect of reducing their loss not increasing it. You must remember, Sir, steel rails had not been manufactured for any length of time at that period. The first steel rail made was somewhere about 1861 or 1862, and there were very few establishments indeed in England between 1865 and 1875 for the making of rails, they have been multiplied and were being multiplied somewhere about the year 1875.

Steel rails first made in 1861 or 1862.

Purchase of Rails—Contracts Nos. 6-11.

21874. I wish to ascertain, if I can, whether you have given this subject sufficient consideration to know the reasons why rails have been furnished from year to year since that time at a lower price than was then asked, and in fact lower from year to year?—I have been in conversation with rail makers. I have been in conversation with rail makers in 1874 when these rails were purchased, and I was informed by them that they themselves could not understand how they could be made without a very considerable loss to the manufacturers.

Great improvements in the manufacture of rails.

21875. Do you understand that there were great improvements discovered in the process of making rails, so that among other things they could employ less expensive kinds of iron than what they used at that time—that there had been such inventions and improvements as would enable them to furnish them at a lower price: do you know if that is a fact or not?—Oh, doubtless there have been great improvements made, and instead of having small establishments for making rails they have had enormously large establishments for the manufacture of the article.

Owners of large establishments found it expedient to keep them going.

21876. Do you mean they have increased their establishments to a great extent since 1874 or 1875?—They have increased since then. I do not know the dates, but large establishments have been made since then, and the owners of those establishments, many of them, found it expedient to keep them going.

21877. Has the producing power of the rail manufacturers been largely increased since 1874 and 1875?—I do not know that it has. I do not know whether it was before or since, but of late years, I can say of late years, the producing power of the rail manufacturers has increased very much. I do not think 1874 was an epoch in the manufacture of rails. The manufacture has been going on steadily ever since the first rail was made in 1860 or 1861.

21878. Is there any well known improvement which has been discovered in the making of steel rails?—Yes.

The Bessemer process.

21879. I mean well understood in your profession?—There is the Bessemer process, and other processes of a like kind.

21880. When was that introduced?—I think that was introduced as long back as 1861.

21881. Is there any improvement since 1874 and 1875 which would explain these rails being furnished so much lower than the price at that time?—Well, I am afraid I cannot speak positively as to dates; but I know the Bessemer process led to the manufacture of steel rails, and until the invention of that process the steel rails were not made, as a rule.

21882. I have understood that Mr. Sandberg's communications to you, and your opinion upon them, were based upon this idea: that the price at that time was so low that it led to the conclusion that rails could not be provided and furnished by the makers at any materially lower price?—If you substitute the word would for could my answer would simply be yes.

Sandberg led witness to conclusion that manufacturers of rails would not supply them at a lower price.

21883. Then do you mean to say this: that at that time Mr. Sandberg led you to the conclusion that the manufacturers could supply them safely at a lower price, but would not?—Mr. Sandberg led me to the opinion that the manufacturers would not supply the rails at any

Purchase of Rails—Contracts Nos. 6-11.

lower price, and that the price of rails in the market would not be any lower.

21884. I have understood from the beginning that he was of the opinion that they would not be furnished at a lower price, but I have also understood you to say that the reason why they would not be furnished was because he believed they could not be. Is this right or wrong?—I cannot speak very positively on that point. It may or may not be right. It is a good while ago, and I have not the papers before me to refresh my memory

A good while ago, and he has not papers to refresh his memory.

21885. Can you say this, in the absence of documents, that Mr. Sandberg gave you any reasons for his conclusions as to the probability of the price remaining as it then was or going up?—I fear I cannot say more than I have done. I have referred to those letters and stated the contents to the best of my recollection, and he satisfied me that it was a good time to buy rails. I am quite aware that it has turned out to be a mistake, but I would not be candid if I did not say what I felt at the time.

21886. I am quite sure of that part of the matter, and I quite understand that you were led to the conclusion that it would be a good time to buy, so we need not discuss that feature any more, but I want now to get down to the reasons for that conclusion, if I can, and I wish to know if Mr. Sandberg made the mere suggestion that it was a good time to buy, or whether he gave you reasons which you considered and upon which you based your opinion?—If I had the letters before me I would read them with the greatest possible pleasure, but I have not got them and cannot find them.

21887. Can you say whether he gave you any reasons beyond the bare statement that it was a good time to buy?—I cannot give you any further information than I have already expressed.

21888. Can you remember now whether he gave you any reasons for his conclusion?—I cannot remember.

T. R. BURPE's examination continued: BURPE.

By the Chairman:—

21889. You have heard Mr. Fleming's evidence on the subject of this correspondence with Mr. Sandberg?—I have.

21890. Were you in charge of the correspondence of the Engineer's Department at that time?—Of Mr. Fleming's part I was.

21891. Have you searched for any letters from Mr. Sandberg of the nature which he has mentioned?—I have.

Has been unable to find the Sandberg correspondence.

21892. Have you been able to find them?—Not as yet.

21893. Is there any person else who would be more likely to find them than yourself?—No; I think not.

21894. So that calling any one else in the Department would not assist us in the discovery of the documents if they are there?—I think not.

Purchase of Rails—Contracts Nos. 6-11.

SANDFORD FLEMING'S examination continued:

By the Chairman:—

Thought that by making a purchase of rails some substantial progress would be made.

21895. Does anything further occur to you as likely to afford any explanation of this rail transaction?—No, I think not, beyond this: I was very desirous to see some progress made in the construction of the railway, and thought, inasmuch as it seemed a good time to purchase rails, that by making the purchase of rails some substantial progress would be made.

21896. Do you mean that you desired to see progress made, irrespective of the cost?—Not irrespective of the cost; but putting the two circumstances together, I considered it was a good time to secure some rails. I knew they would be wanted before very long. At the date referred to, August and September, 1874, there was very little done in the way of construction, and we had spent a great deal of money in surveys, and I was naturally desirous to see some commencement made. The only contract for grading that was entered into that year was for the Pembina Branch, or that portion of it south of St. Boniface.

21897. Do I understand you now to say in evidence that this 50,000 tons of rails was purchased because at that time you considered that they would be shortly used?—When I spoke of the matter, instead of 50,000 tons only 5,000 tons was advertised for.

21898. Is it then as to the 5,000 tons only that you are speaking when you say you thought it would be necessary to buy them for use?—I am not speaking as to any particular quantity, simply as to the purchase of so many rails as were then deemed advisable.

21899. I understand you to give as one of the reasons for suggesting this purchase, that at that time you considered rails would be required for use?—Yes.

21900. Well, did that reason apply to any particular quantity or did it apply to an unlimited quantity?—It did not apply to any particular quantity. I can hardly say an unlimited quantity, because an unlimited quantity may be a very large quantity.

21901. Then if not to an unlimited quantity to what limited quantity would your reasons apply?—Well, I am hardly prepared to answer that question.

A great deal of hesitation as to beginning the works through causes partly political.

21902. Did the work progress as you expected at that time they would progress, or was there any particular stoppage or delay in them?—There was a great deal of hesitation about the beginning of the works through some cause or other, partly political, if my recollection is correct.

21903. Do you say that the works of construction did not progress after that time at the rate that you then expected they would progress?—Not so rapidly as I would have wished.

Cannot say to what amount of rails, one of the reasons given for advising the purchase, that they would be shortly required for use would apply.

21904. Expected, I said, not wished?—I can hardly recall at this late day what my expectations were then.

21905. Could you say, after discussing this matter to the extent which we have now discussed it, to what amount of rails the reason which you have given would apply—I mean the reason that they would be shortly required for use?—I could not say.

Purchase of Rails—Contracts Nos. 6-31.

81906. I will show you your return in 1877, showing the use that was made of them up to that time, perhaps that will assist you in saying how far this particular reason applies to the transaction?—In 1874, I could not possibly indicate how many would be wanted in certain years or months or where they would be wanted. That depended upon circumstances over which I had no control. All that I knew and felt was that it was desirable to secure a considerable quantity of rails. In the public interest I felt it was desirable.

21907. I have understood you to say that this transaction really emanated from you—that although there was no written report on the subject, you had in conversation with the Minister suggested it, and that it was based upon your suggestion; perhaps I am not right, but I wish to make clear what you say on that matter?—I am not prepared to say it emanated from me alone, I am only prepared to speak with regard to the little part I had in it. The Minister may have consulted many others besides myself. He did not take me into his confidence. He only listened to what I had to say, and sometimes he considered it and acted on it, and sometimes he did not.

Minister did not take witness into his confidence. He listened to what witness had to say and sometimes rejected and sometimes acted on his advice.

21908. Well, am I right or wrong in supposing that you approached him with this recommendation based upon Mr. Sandberg's communication?—I approached him with this communication, as far as I can recollect, voluntarily and unsolicited by any one.

21909. And you give now, as one of the reasons for that opinion, that rails were then likely to be required for use?—That is one of the reasons; yes.

21910. Could you say to what extent that reason applied to these transactions: could you say how far it operated on your mind at that time?—I could not now say.

21911. Do you think 10,000 tons were then considered likely to be soon required?—I should think a very much larger quantity of rails than 10,000 tons.

21912. 10,000 tons would lay about 110 miles?—Yes.

21913. 20,000 tons?—If my impression had been right with regard to a speedy rise in the price of rails, it would have been advisable to lay in a much larger quantity than 10,000 tons.

21914. Of course you understand you are giving two reasons which operated on your mind for the expediency of this transaction—one is the pecuniary feature of it, that it was a good speculation?—Yes.

In addition to the financial reason and the reason that some rails would soon be required, a third reason operated on his mind namely, that as a citizen of Canada he was anxious to see line built.

21915. The other is that they would be required for use, and had to be got irrespective of the cost?—I have mentioned a third reason.

21916. What is the third reason?—The third reason is, that I, myself, as a citizen of Canada, was very anxious to see the railway commenced.

21917. And did you think that the purchase of the rails, irrespective of their probable use, and irrespective of their cost, would be a good thing to recommend?—Not irrespective of use, but putting all the circumstances together it appeared to me a proper time to purchase rails.

21918. But not irrespective of the other two reasons?—Not paying any price for them.

Purchase of Rails—Contracts Nos. 6-11.

21919. Can you name now more than two motives for the purchase: one the pecuniary feature, the other the necessity or probable necessity for the rails?—I do not understand that.

21920. You have mentioned a personal reason, that as a citizen you thought it advisable?—That is a public reason.

His third reason a public reason.

21921. I thought you mentioned that from your stand-point as an individual citizen?—Well, it is a public reason, if I understand what a public reason is.

21922. Was that an engineering reason, or in your character as an engineer of the road?—No; I have made a distinction. I have spoken of myself as one of a number in Canada.

21923. Then that is the third reason for suggesting the propriety of the purchase?—Yes.

21924. Now would that third motive be irrespective of the other two reasons, or would it in fact be based upon the soundness of the other reasons?—They all entered into my mind at the time.

21925. Do you separate that from the others?—I do not separate them at all. They all entered into my mind at the time.

If the two former reasons were not good the third would not have weighed with him to the same extent.

21926. Do you think that that third reason would have weighed with you if the other two had not been good reasons?—Not to the same extent at all events.

21927. Would it to any extent if the other two had not been good reasons?—To some extent it would, but perhaps not to the extent necessary to recommend the purchase of the rails. If the price had gone up, if the table furnished by Mr. Sandberg had simply been reversed, and they seemed to have reached the highest point instead of the lowest, apparently the circumstances would have been changed.

But the third reason was one of the motives which led him to recommend the purchase.

21928. I am aware of that; but I am speaking of this third reason which appears to have weighed with you as one of the public. I understand you to say now that this third reason was not in your character as an engineer but as one of the public: do you say that that was one of the motives for recommending this matter to Mr. Mackenzie or not?—I think it was.

21929. Then was it a reason which would weigh with you, although the other reasons were not good?—It would always carry some weight.

21930. Would it have actuated you to the extent of recommending to Mr. Mackenzie, although the other reasons were not valid ones?—I do not think it would.

21931. Then it depended on the validity of the other reasons?—To a large extent.

21932. Did it not entirely?—No; if it had any weight at all it would have weighed in the scale.

21933. Would it have weighed with you sufficiently to recommend it to Mr. Mackenzie although the other two were not valid ones?—It would not of itself.

21934. Would it have weighed with you at all, in the direction of recommending it to Mr. Mackenzie, if the others were not good?—That reason alone would not have been sufficient.

Purchase of Rails—Contracts Nos: 6-11.

21935. Then does not the transaction stand upon the basis of the other two reasons?—Not entirely.

21936. Though both the other reasons were not good this would have weighed with you?—If you consider all three reasons of equal weight, the three together may influence one to a certain line of conduct, but two of them might not be sufficient, or one might not be sufficient.

21937. That does not appear to me to be a correct way to elucidate the matter. I will explain to you the impression your evidence leaves upon me, and you can see how far it affects the position you take. I understand you to say that there were two features in the transaction which recommended themselves as valid reasons to you, first, that it was a good time to buy rails because their price was not likely to go down—that, in fact, it was a good speculation for Canada to go into; the other was that some rails would be required for actual use on the Pacific Railway?—Before long.

Witness thinks the third reason as given above does not depend on the other two also stated above.

21938. Now if those two features were not valid, I cannot understand why a citizen of Canada knowing this should say: "act upon those two reasons;" and it seems to me that the propriety of the third motive depends entirely upon the belief in the strength of the others—that, in the language of your profession, it is in fact but a superstructure to be built upon the others?—I do not see it. I think the third reason might really come first—at all events between the other two. First of all it was a favourable time to make the purchase of the rails; second, it was desirable to have a commencement made in the construction of this railway; third, if it was desirable to have a commencement made these rails were wanted before long. That is the way in which I put the reasons.

21939. Would this third reason, which we may speak of as a citizen's reason, as distinguished from a professional reason, have been a good one if the others were not good?—It might have been a perfectly sound reason if the others were positively bad.

21940. Then I will proceed to the next subject, unless you have something further to add upon this matter: is there anything further?—Nothing further. I mean a perfectly good reason as far as it goes. It may not have been sufficient to justify me in making any recommendation.

Surveys—Smith's Map.

21941. There was a matter which was mentioned by Mr. Marcus Smith in his evidence. It was a map and a report made by him in the spring of 1878, just before your return from England, and strongly recommending a route which was not adopted: would you please add whatever you think necessary to the evidence upon that subject?—A very great deal has been said about that map, but not quite enough. In a report which I had in my hand the last time I was at this table, it was referred to in three or four words. I refer to a report addressed by me to the Minister of Public Works on the 2nd May, 1879, enclosing the report of Mr. Marcus Smith, dated the 12th of April, 1879. Mr. Smith stated that he had sent to the Department of Public Works a report in the previous year, dated 29th of March, 1878, and that:

"An essential part of the report was a map appended showing the several routes, and the prevailing features of the country by colours referred to in the margin. The map, for reasons not necessary to discuss here, was not issued with the printed reports although it had been approved by the Minister of Public Works, and a large number

Surveys—
Smith's Map.

of copies had been struck off; consequently but few persons have read the report, as it is difficult to follow or understand the description of several routes over 2,000 miles of country without the aid of a map."

With respect to this map, I state in my report to the Minister of the 2nd of May, 1879, as follows :—

Smith's map incorrect.

"Mr. Smith refers to a map prepared by him accompanying his report of March last year. When this map came under my notice I found it incorrect, not being in accordance with known facts, and hence calculated to mislead. In the execution of my duty I pointed out those inaccuracies. It is essential that all maps bearing the authority of the Department should be unimpeachable; accordingly the Department considered that in the public interest the map should not be published."

Now this map was brought up again in the evidence of Mr. Smith, and I think it is proper that I should give some further explanations than those I have just read. Now here is the map, the very map that was in my hands on the 24th of May, 1878, or a copy of it. (Exhibit No. 313.) I was very much pressed with various duties before leaving Ottawa in that year, and I took with me a number of matters to consider and dispose of as I travelled. Among others there was this matter, and I wrote on the train, between Metapedia and Halifax, the following letter addressed to Mr. W. B. Smellie, Ottawa, on the Queen's Birthday, the 24th of May :—

"On train to Halifax,
"May 24th, 1878.

"W. B. Smellie, Esq, Ottawa.

"My Dear Sir,—I herewith return the proof of memo. of information for the parties proposing to tender for the whole Pacific Railway, with some corrections and additions which I have suggested, and which I would like you to show to Mr. Mackenzie before sending to the printer.

"I also return Mr. Smith's map, and have to remark with regard to issuing it, as follows :—

"I think the attempt that has been made in this map and also a map that has been prepared by the Department of the Interior——"

Of the latter map, I think at this date there were some 15,000 printed—3,000 of this and 15,000 of another map of the same kind—

Condemns making marked distinctions by means of colour on map to indicate soil in North-West Territories on the ground of want of sufficient information.

"To colour the different kinds of soil by distinct tints, with strong arbitrary lines between them, is a mistake and apt to mislead, as we have not acquired information at all sufficiently accurate to enable any one to make such marked distinctions over wide areas, portions of which no one has ever visited, without drawing very largely on the imagination. It will be easily seen that if the Pacific Railway is put under one contract, serious difficulties may arrive hereafter with the contractors, who will be paid partly in land, and who possibly may, when the day of reckoning arrives, establish claims against the Government, founded on these very maps, by which they might say they were grievously misled.

"If Mr. Mackenzie should consider it expedient, notwithstanding what I have pointed out, to issue the map, so as not to be open to the charge of not keeping back a map which has been prepared; or if it be considered at all necessary to show the line advocated by Mr. Smith in his report, I certainly think that the description of the different kinds of soil in the corner, should be erased, or a piece of paper pasted over it.

"This would, in my opinion, largely, although not altogether, remove the objection that I have raised. If this course be approved, it might be sent out at the same time as the general Pacific Railway report, but not necessarily bound up with it, in fact it would be better sent as a loose sheet, as it is too cumbersome to be bound with the pamphlet.

"Yours very truly,
"SANDFORD FLEMING."

That was the explanation that I submitted to Mr. Smellie to lay before the Minister; and it would appear that during my absence the Minister, after consulting with Mr. Smellie and Mr. Trudeau, the Deputy Minister, decided not to issue the map. The map, however, is now being issued, but the suggestion referred to in the letter has been acted on; the description of the soil in the corner has actually been

Surveys—Smith's Map.

cut out and a blank piece of paper inserted, so that if I have been in the least wrong in the course I have ventured to take other parties are equally guilty. I made the suggestion purely in the public interest, and the past Minister of Public Works, and the present Minister of Railways and Canals, and the Deputy, and others, seemed to concur in the view that the suggestion I made was a wise one.

21942. This map was apparently constructed upon the basis of information obtained by Mr. Smith during the season of 1877: do you remember whether you gave him any instructions before his starting upon the expedition of that year to obtain any such information, or to recommend any such course for the route as he did recommend by the report which accompanied this map?—I do not think the map was prepared on information obtained by him in 1877. The objection I had to the map was it was prepared without sufficient information.

21943. When I say based upon the information, I do not mean that it was mainly the result of that information, but it was to some extent the information which he then got that gave rise to this map—that is the conclusion which we were led to from his own evidence; he made many enquiries from different persons as he passed over the country, saw what he could himself, and from the parties immediately under his charge, as well as independent parties, gathered all the information he could about the country, and then, from that and other information, made this map. It occurred to us that possibly he was not entirely within the limit of his instructions in doing this?—I had no objection to that. I had no objection to the map, excepting the colouring of it, and I suggested in the letter I have just read to you that the reference to the colour should be erased by cutting it out, or putting a piece of white paper over it, so as to remove the difficulty I pointed out with respect to possible claims being established by contractors or others who might in the future be misled.

Witness objected only to the colouring which might have established claims by contractors or others who should be misled by a map which professed to give information which did not exist.

21944. Then, as I understand your evidence now upon that subject, the objection to the map, in your mind, was this: that it professed to give persons who were interested distinct lines which professed to define the areas of the different kinds of soil?—It professed information that did not exist.

21945. Upon that subject I have alluded to?—Upon the subject of soils.

21946. Besides the map, I think he advocated a general route for the railway?—Yes; he advocated a general route for the railway very strongly.

21947. Was that within the limit of his instructions?—That I had no objection to at all. I did not care what he recommended.

21948. Withholding the publication of the map was not in any way the result of a difference of opinion on that route?—Not at all, for the reasons stated in my letter.

Marcus Smith recommending a route had nothing to do with suppression of the map.

21949. Is there anything further connected with this report of Mr. Smith, or this map, which you think necessary to explain?—Yes, in the reports of the examination given in the public papers, there is a statement made which is not strictly accurate. I do not, at this moment, remember the exact words; but it is to the effect that Mr. Mackenzie telegraphed for me to report in accordance with Mr. Mac-

Railway Location—Smith's Report.

kenzie's own views, or something to that effect. I say that is not correct. It is in the evidence of Mr. Marcus Smith. Probably he did not mean to say that, but as published to the world it is not correct.

Hon. A. Mackenzie telegraphed for witness, and told him when he arrived that he had lost confidence in Smith, and wished witness to report on the whole subject, and to consider Smith as no longer an officer of the Department.

21950. What is the correct account of the circumstance?—I was telegraphed to come out to Canada on very short notice. I came very hurriedly in mid-winter; broke into the leave of absence that I had been promised and required. The first person I had any interview with in Ottawa was, of course, the person who telegraphed for me—Mr. Mackenzie. He, among other things, told me that Mr. Smith had recommended very strongly a particular line for the railway, but that he had lost confidence in Mr. Smith; that he had not spoken to him on any subject for a couple of months. He thought that Mr. Smith was strongly biased, and said something more which I do not now remember. He said, however: "I want you to take up the whole subject, and give me your opinion. If you endorse Mr. Smith's views let me know; if you do not, report accordingly; but before being guided by the report of Mr. Smith, I want to have the benefit of your opinion." Mr. Mackenzie did not ask me to report against Mr. Smith's views, or in favour of them; he said he wanted my views. He further informed me that I must consider Mr. Smith as no longer an officer of the Department. He did not receive his dismissal, but he was as good as dismissed, and I was not at liberty to consult him any longer, inasmuch as he was no longer a public officer. After leaving Mr. Mackenzie's room I went to my own, and sent for Mr. Smith, and repeated to him word for word the conversation I had with Mr. Mackenzie, and, of course, I mentioned to him that it was with very great regret I was obliged to take my own course, and use my own judgment without consulting him.

21951. Up to the time of this interview with Mr. Mackenzie, immediately after your return, I understand you to say that you had not given the matter of Mr. Smith's report your own individual consideration?—I had not.

Hon. A. Mackenzie conveyed to witness the idea that Marcus Smith was a man biased in his opinion.

21952. Mr. Mackenzie, at that time, conveyed to you the idea that he thought Mr. Smith was biassed in his opinion?—He did say so.

21953. Was that upon the subject of this same report, and the matters upon which Mr. Smith had reported?—I think so.

21954. Did you understand from that that he differed from the views expressed by Mr. Smith in his report?—Possibly I did, but I do not know now. Possibly I did.

21955. Then, in effect, he communicated to you the idea that he and Mr. Smith were not in accord in the matters recommended by Mr. Smith?—He told me he had not spoken to Mr. Smith for two months; but still they might disagree on the matter of the report, for it was in writing.

21956. I understood you to say that he thought Mr. Smith was biassed concerning matters embraced in his report?—I do not know that he had reference to that particular report, but he spoke as if he was a man that adopted a view and adhered to it through thick and thin.

21957. Were you led to understand at that time by Mr. Mackenzie, that he did not agree with Mr. Smith's views?—I cannot tell you now. I think it is not unlikely; it may be he told me as I have already stated, that the Government could not be guided by Mr. Smith's views

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alone. If I concurred in the views of Mr. Smith, then they would consider both; if I did not, they would take some other course.

Report of Marcus Smith recommended route by Pine River Pass and terminating at Bute Inlet.

21958. As I understand it, the main matter of Mr. Smith's report was a divergence of the whole route of the line north-westerly so as to get a route by Pine River Pass?—The purport of the report was to get a line that would terminate at Bute Inlet by way of Pine River Pass.

21959. That was a very material divergence from the route up to that time approved of?—I forgot to mention that among the things that Mr. Mackenzie told me he said the Government were bound to come to some decision, one way or the other, as of the route in British Columbia while the House was in Session, and it was a very serious matter, and required very grave consideration, and they were very much embarrassed by the course that Mr. Smith had taken and especially in view of the very decided bias he had always shown previously.

21960 Do you mean a bias in favour of some particular route, or a bias about some other matter?—Bias about the routes generally.

Smith long before this report had shown a determination to take the line to Bute Inlet.

21961. Of course he could not be biased in favour of them all; I suppose you mean that he had a bias in favour of some one particular route?—It is a very long story, and it is next to impossible for me to condense it into reasonable limits; but Mr. Smith for a long time before this had shown a determination to take the line to Bute Inlet, and there was no concealing that.

21962. But that might be accomplished without going through the Peace River and Pine River Pass?—That could be accomplished by going through the Yellow Head Pass, but all these matters are so fully discussed in my various reports that it is hardly fair to tax me with any other discussion respecting them.

21963. Well, we will leave that subject: is there anything further that you wish to say about section 15?—Yes.

The Map.

21964. Before taking up the next subject, have you anything further to say in reference to any of the subjects which we touched upon this morning?—I can only say if the Commissioners could receive from me, and if I could give to them certain letters in my hands elucidating the whole question respecting the map——

21965. You mean the map which was said to have been suppressed?—Said to have been suppressed.

Does not offer correspondence with Marcus Smith in evidence because Smith's letters were marked "private."

21966. If you could do that?—If I could I would be happy. But unfortunately the letters which passed between Mr. Marcus Smith and myself are marked "private" I would willingly make my own public and official, but I cannot use his in that way without his consent.

21967. Then I understand you do not offer them in evidence?—I do not offer them in evidence, for the reason they are marked private. Passing to another subject discussed this morning, a letter has been found by Mr. Burpe which is not all that I would have wished, but it has reference to the rails purchased in 1874. It is dated London, December 17th, 1874, and among other subjects which I need not read, with regard to nuts, bolts, fish-plates and specification for rails and other matters, he uses these words towards the end :——

Purchase of Rails—Contracts Nos. 6-11.

By Mr. Keefer :—

21968. Who is it?—Mr. Sandberg. He says:

Sandberg writes suggesting that a strike might take place which would send up rails.

"It is indeed not unlikely that a strike would take place which would probably send up prices, and therefore I am anxious to have everything square. By the enclosed card of prices you will see that you have bought both this and the last order at very favourable periods. In fact, in the whole of my experience I know of none having used the time better, and I only hope that this order will be executed a little quicker than that at Barrow, which is still lingering on slowly."

The rails that were manufactured at Barrow, that he had reference to, I think were for the Intercolonial Railway. There is nothing else in the letter. (Exhibit No. 315.) I merely produce that to show that at that date, 17th December 1874, Mr Sandberg was still of the opinion it was a favourable time to purchase rails.

By the Chairman :—

21969. This letter, of course, was not one of your reasons for the recommendation you made?—No; it was after the recommendation, but it goes to confirm what I said that letters have been received from Mr. Sandberg.

Railway Location—Contracts Nos. 14 and 15.

21970. Have you any further explanation or evidence to give concerning section 15?—I have When I was last before the Commissioners I expressed a wish that Mr. Rowan should be heard with respect to the two lines—the adopted line and the southern line.

21971. The Forrest line do you mean?—No; the southern line.

21972. That was a line covering the ground of sections 14 and 15 to some extent?—No; the alternative line from Rat Portage to some point on section 14.

21973. Then that covered the ground partly of section 14 and partly of section 15?—I am not speaking of Cross Lake at all—the general route of the railway from Rat Portage towards the river. When leaving here I asked Mr. Smellie if he would be good enough to write Mr. Rowan, and see if he remembered anything about it, see if he could furnish the data on which the decision was arrived at, and he writes as follows:—

"CANADIAN PACIFIC RAILWAY,
"MANITOBA, DISTRICT ENGINEER'S OFFICE,
"WINNIPEG, 4th May, 1881.

Rowan's letter respecting southern line.

"W. B. SMELLIE, Esq., Ottawa.

"MY DEAR SIR,—Your letter of the 25th inst., in reference to Mr. Carre's evidence before the Railway Commission only reached me this morning. In reply I would say that I have not now any papers connected with the Canadian Pacific Railway in my possession——"

The Commissioners are probably aware that Mr. Rowan is no longer an officer of the Government, he has resigned his position—

Laid all the information furnished by Carre before Fleming, and both decided that it was not desirable to recommend southern line saving only $100,000, and lengthening the line five and a-half miles for all time.

"I may say, however, that I have seen Mr. Carre's evidence and Mr. Fleming's letter to you, as published in the newspaper within the last few days. As regards the subject under discussion, I have the most distinct recollection of the following facts, viz: all the information which Mr. Carre furnished in reference to the 'southern line,' together with the plan and profile, and as sent in by Mr. Carre on the completion of the survey, were submitted by me to Mr. Fleming, the Engineer-in-Chief, and that he and I together made a careful examination of the relative merits of the two lines in all their bearings with the information *then* furnished; and that the conclusion arrived at was that it was not desirable to recommend the adoption of the southern line, involving as it would the abandonment of considerable work executed on the

Railway Location—Contracts Nos. 14 and 15.

present line, the lengthening of the line by at least five and a-half miles, and delaying the work of construction—especially as according to my recollection, the pecuniary saving to be effected did not exceed $100,000 according to our estimates, and the line would have been lengthened for all time at least five and a-half miles.

"Yours truly

"JAMES H. ROWAN."

That is all I have to say. (Exhibit No. 316.)

21974. Is there anything further which occurs to you concerning section 15?—Nothing further occurs to me at this moment, beyond the fact that the whole matter was done in perfect good faith, believing that it was best in the public interest to adopt the particular route that was adopted.

Railway Construction—Contract No. 25.

21975. Do you wish to add anything to your evidence touching the measurement of the muskeg excavations, or any other matter connected with the subject?—In reading over my evidence on the muskeg material, I find it terminates rather abruptly. After question 19,548, I think it would have been well had it been followed up by some other questions, or if I had volunteered then to give some explanations which I wish now to give.

Muskeg.

Principles which should guide an engineer as between the Government and the contractor.

21976. Please proceed with them?—I will give you my views with regard to the muskeg question. There are certain leading principles by which I hold an engineer ought to be governed in dealing with public works under the Government. First, the engineer is not a contracting party, he is simply an executive officer appointed to see a contract properly carried out, and justice done alike to the public and to the contractor in the matter of measurement or other things. His judgment should be guided in the contract and the specifications, and in such contracts as those under consideration, every kind of work is intended to be embraced in the schedule of rates and prices attached to the contract. If there be any exceptional or special work necessary to be done, which may not have been foreseen when the contract was originally entered into, and no price fixed for it, the engineer, not being a party to the contract, should not fix it; it should be established by the principal parties to the contract. Assuming that muskeg is an exceptional description of work, it is quite clear to my mind that the engineer should not have the power of fixing the value by increasing the quantity of useful work which that material will produce. If a solid yard of embankment formed of muskeg, is worth twice as much as a yard of common earth in an embankment, in that event the contractor should receive double price, but the Government is the only party that should fix the additional price for the use of that material where it is necessary to be used. I shall endeavour to illustrate my views by taking a case in which the solid contents of material in the formation of a section of railway is 1,000,000 yards, and the price of earthwork is fixed at 33 cts. per yard. If this section be completed with earth it would cost $330,000, but if earth cannot be had, and it becomes necessary to employ more expensive material for which no price has been fixed, the engineer should not fix it. It should not be in his power to fix it or to allow the contractor compensation for the use of the new and more costly material by any process whatever. If the new material is worth twice as much as earth, I hold that the Government should fix the price, and that the engineer should not be called upon to certify that there are 2,000,000 yards of earth in the formation of a railway section while there is only 1,000,000. If it be right and proper to pay the contractor $660,000 for the work, that is reckoned at 66 cts. per yard when

If material employed for which no price fixed the engineer should not fix it.

Railway Construction—Contract No. 25.

Muskeg.

executed with muskeg material, then the price should be made as I have stated, 66 cts., and the certificate of the enginneer would stand thus: 1,000,000 yards of muskeg material at 66 cts., total $660,000; and it should not stand in this way: 2,000,000 cubic yards of earth at 33 cts., giving it the same total, $660,000. Of course, in the case as it is put, the compensation to the contractor would be the same, but the responsibility would rest upon the proper shoulders; the Government, being the principal party to the contractor, would fix the price, and the engineer would not be called upon to certify that a piece of work contains 2,000,000 cubic yards while it only actually contains 1,000,000. It has been stated, in evidence before this Court, that it would be impossible to measure muskeg in the embankment. I am not of that opinion. My experience has taught me that where there is a will there is always a way, and I hold that there would even be less difficulty and much greater certainty in arriving at accurate measurements of the solid material of an embankment than in measuring muskeg in the way in which it has been done.

No engineer should certify for double the quantity found in embankment.

21977. You suggest that it has been stated, by way of evidence before us, that it would be impossible to measure the quantities in the embankment: is that what you say?—Yes.

21978. I do not remember that suggestion, but I remember that it has been said it would not be fair to measure the quantity in the embankment, and that the quantity excavated should be the criterion established for the quantities in the certificates. The argument has been that although the quantity was less after the compression in the embankment, there was no difficulty in ascertaining what there was there, but that it formed no information on which to show what had been excavated: is not that a correct statement of the argument as you understand it?—I do not know that it is. I understood that it was stated here that it would be impossible to measure it in the embankment. Of course if it was impossible to ascertain the quantity of an embankment, there would be no need of attempting to settle with the contractor in that way; but it is not impossible, it is perfectly practicable. I do not say that the contractor would be fairly paid or fully paid if no change was made in the price. I think every contractor ought to be fairly dealt with, but the system of measuring two yards for one is a bad one, or calling one material another kind of material.

In order to be fair to the contractor perhaps a change should have been made in the price.

21979. You are evidently under the opinion now that there has been some difficulty suggested, because of the impossibility of measuring the actual quantities as they remain finally in the embankment. That is a new idea: it has not occurred to us, and it has not been advanced by anybody?—It is certainly given in the published evidence.

21980. Well, it is not correct. At all events, the difficulty as I understand it is this that, although the quantities could be ascertained in the embankment, they did not show how much had been excavated and the contractors contended that they were to be paid for the amount excavated and not the amount remaining finally in the embankment, not because of the difficulty of measuring this, but because of the impropriety and injustice of taking that as decisive as to the quantity which had been excavated?—I found that some of the engineers were disposed to attach prices for work done, which work there was no price for in the schedule of prices.

Railway Construction—Contract No. 25. Muskeg.

For instance, a fire might break out in the woods and the contractor would be put to some expense in saving the timber of a bridge or of a building. I found in the returns the expense reduced two yards of earth—so many yards of earth equivalent to so much money. Of course, I put down my foot at once, and I said: "This principle is wrong." The return should show exactly what the expenditure is for, and I hold that muskeg should be treated in precisely the same way. If there was no price in the contract for muskeg, then it was for the Government, and for the Government alone, to fix the price for it. In all those other cases that I refer to where expenditures have been returned to me for exceptional work, such as putting out fires and this, that and the other thing, I always insisted on them being called by their right names and left the Minister to fix the price for them.

If there was no price in the contract for muskeg or any other item then the Government should fix the price for it.

21981. In order to make plain what I understand to have been the difficulties suggested as to the measurement I will state now my view of what has been said. You, in giving evidence upon a former occasion, said that the specification permitted an engineer to estimate this muskeg material upon a different basis from ordinary material, because one clause in the specification provided that where it was impossible to measure the material that then an unusual rule might be applied, intimating, as I understand it, that it was impossible to measure the material from the place from which it had first been taken. That was the difficulty which I understood had been suggested by you, and which led to the application of this particular clause in the specifications—that was one difficulty; the other was not the measuring in the embankment, but that upon the re-measurement in the muskeg locality the ditches and other places from which material had been taken would be so changed in their shape that they would not afford information to enable an engineer to find out the quantities first excavated?—Possibly not; but there ought to be no difficulty in measuring an embankment at any day.

21982 I have not yet seen that any person has suggested any difficulties in measuring the embankments?—My invariable custom has been, in connection with these works and other works, to face the difficulty at once, and I am not reflecting on any one when I say this, for not taking the course I did; but I think it is a mistake in principle to allow this to go on until the end. I think when it was first discovered that it was an exceptional kind of material to be used in the work, that was the time to take the bull by the horns and bring the matter before the Government, and throw the responsibility on the Government as one of the contracting parties to deal with it. Remember, I am not in favour of paying the contractor less than what it cost him. I think the contractor ought to have a fair price for his work—a liberal price for his work for that matter—but at the same time the prices ought to be fixed in a regular way. I do not think the engineer, or any one of the engineers, or any one of his assistants, should have the power of fixing the price directly or indirectly.

When character of muskeg material first discovered the question of how it was to be paid for should have been brought before the Government.

21983. That is beside the question. I do not think that in any part of this investigation it has become a matter for serious consideration whether an engineer might make a new contract for the Government, and I do not understand that is a point in the dispute. I have understood you to say that it would not be proper to certify that there were 2,000,000 yards in an embankment, when in fact there was only

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1,000,000 : now, do you remember any certificate at any time given by any engineer in which he certifies to the quantity in an embankment ?—He certifies to the quantity in the work.

21984. What is the work ?—It is the railway.

21985. But do you remember, at any time in your experience, an engineer certifying to quantities in an embankment ?—I have done it myself,

21986. Under what circumstances ?—Under circumstances not unlike these ?

21987. And did the certificate purport to state the quantities in the embankment ?—The certificate stated exactly on the face of it what it meant, and every certificate ought to do the same.

21988. But as I did not see it, I cannot tell what was in it : what did it say ?—So many yards of earth in the embankment.

21989. Did the contract provide, in the case to which you allude, that the quantities might be measured in the embankment ?—The case to which I refer was simply a contract of this kind : the contractor was to receive payments for so much earth excavation or earth work —earth excavation means earth work.

When earth excavation is contracted for at so much a yard the quantity remaining in the work is not always a fair criterion.

21990. Do you mean that when you contract for earth excavation at so much per yard that the quantity remaining in the work is a fair criterion ?—Not always.

21991. But is it the case ?—There are exceptions to ordinary rules, and if this is not an exception it ought to be one.

21992. We are getting away from the matter under investigation : you mean, perhaps, that it ought to be provided in the specification to be exceptional ?—It ought to be made exceptional the moment the difficulty arose.

21993. Do you say that under this contract, and under this specification, you conceive it to have been a right course for the engineers to certify the quantities in any embankment ?—The right course to pursue is exactly the one I have pointed out, in my judgment.

21994. Are you aware that these specifications provides as to how this material shall be estimated, and how it shall be classed ?—The word muskeg is not found in the specification.

21995. Are you aware that there is a clause which covers exactly this case ?—No ; I am not aware.

Sub-section 3 of clause 17 provides that muskeg shall be classed as earth.

21996. Are you aware that in sub-section 3 of clause 17, these words are used :

"All excavations of whatever kind, with the exception of off-take ditches, found in clause 13 shall be deemed earth excavation ?"—

Allow me to refer to another clause with respect to earth excavation.

21997. But you have not yet answered my question ?—Yes; that would go to show that this muskeg material might be called earth.

21998. Under the specification ?—Under this particular specification, but this does not make the matter any better. The difficulty is with regard to the measurement of this peculiar kind of earth. I hold that we ought to pay for the useful effect produced by the work itself. The

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same in a bridge or building; we would not measure the stone in the quarry, we would measure the solid wall in the bridge or building.

21999. That would depend on the contract, would it not?—Some quarries would produce a very small proportion of building stone and a great deal of debris, while others would produce a very large proportion of building stone.

22000. Don't you see that to make that at all an analogous case the contract would have to recite that the man was to be paid for the building by what was measured in the quarry—it is not usual to make contracts for building on such a basis: in this case the work was to be paid for by the amount excavated?—I admit the specification does not cover the amount sufficiently well, and hence there is the more necessity for bringing it before the Government at an early stage, and throwing the responsibility on the Government.

22001. You assume, as I understand it, that although the quantity excavated could be ascertained, the quantity excavated ought not to be paid for, unless it was subsequently effective in the work?—The quantity of useful material excavated could only be ascertained in the embankment. You could not ascertain the solid contents of a space filled with solid material and liquid material until the one is separated from the other.

In the case of muskeg thinks the knowledge of the quantity excavated was not sufficient to justify giving a certificate for earth.

22002. Is this your contention: that although the quantity excavated could be ascertained, the material being such as it was the knowledge of the quantity excavated was not sufficient to justify an engineer in giving a certificate upon it?—Not in this case, from the peculiar material.

22003. Now, is it not the case in all earth material, that the amount excavated does not yield the full amount subsequently?—It yields more sometimes.

Rule to measure all ordinary material in excavations but muskeg is exceptional.

22004. What is the rule about it; in other words, whether more or less would make no difference, is it not the case that the quantity of ordinary earth excavated is not the same as is found in the embankment when compressed?—It depends very much on the material, and to set all doubt at rest it has been common to specify all ordinary material shall be measured in excavations, but I hold this is not ordinary material. This is exceptional material, and it is necessary to measure this in some other way, and that other way is provided by the specifications.

22005. Is the amount excavated of ordinary earth material the basis for the certificates of the work, or is it the quantity in the embankment, or do these quantities differ as a rule?—The quantity of material in the work is, without any question, the quantity that should be paid for under the certificate.

22006. Do these quantities differ, as a rule, when ordinary earth is used?—They differ slightly when ordinary earth is used, but not to any great extent.

22007. About what extent?—I cannot tell at this moment. It varies.

22008. Well, the average?—There are different opinions about that. Some hold there is more, others less. It depends on what stand-point you view it from. The contractor who is paid one way will argue one way; the contractor who is paid another way will argue another way.

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22009. I am asking your experience as to the relative proportion; whether the earth excavated gives any criterion as to the amount in the embankment?—It does.

22010. What criterion?—As to the proportion of one to the other, I cannot tell you at this moment.

22011. Could you not say near it?—The one is not very much different from the other.

Not prepared to answer as to the preparation between the earth excavated and the earth in an embankment.

22012. Is it somewhere about four-fifths: is there not a difference of between eighty and 100?—It depends on whether it is sand, or clay, or gravel.

22013. That is not answering the question?—I am not prepared to give it to you now.

In case of earth, sand and gravel, certificate is based on the amount excavated because it is easier to measure these materials in the pit.

22014. Would you say this: whether, in any of those cases: earth, sand, or gravel, the certificate is based on the amount found in the embankment or on the amount excavated?—The certificate is based on the amount excavated in those cases, for the reason it is easier to measure in the pit than in the embankment in those cases.

22015. Then, according to that, the amount in the work ought to be paid for, but because it is easier to ascertain the amount excavated, that is paid for: is that what you say is done in ordinary cases?—In those cases; yes.

22016. If the legal effect of the contract in this case is that this material shall be called and dealt with as ordinary earth, then your theory would hold, I suppose; you understand that your argument is really one upon the legal effect of this contract?—Well, with regard to the measurement, it would remain the same.

22017. For instance, if the contractor is entitled to call this earth under the terms of his contract and the specifications connected with it, then this theory of yours about the different material would fall to the ground?—No; I do not think so. I think the responsibility is thrown on the engineer to ascertain the quantity, and he should take the right way of getting it.

Even though the contract declared that muskeg should be dealt with as earth, witness would still hold the opinion that it should not be measured in excavation.

22018. If the contract should also say, first, that this is earth, to be dealt with as earth and should be termed earth, and next that earth shall be measured in excavation, would you still be of the same opinion?—Still, because I would have applied clause No. 30 of the specification to ascertain the quantity.

22019. I think I understood you, upon a previous occasion, to say that you had never considered it necessary, notwithstanding these disputes on the subject, to make the specifications for contracts let subsequently to such disputes any more positive or less doubtful than the previous specifications, as to the mode of measuring muskeg material?—I can give you the reason. The reason is this: I was not aware myself until the other specifications were made. This matter was concealed from me—I do not say concealed purposely, but it was not known to me until the specifications for the other contracts were made and printed.

22020. Then, I understand you to say that you had not the opportunity to correct those specifications so as to save future difficulties upon the same subject?—I was not aware of the difficulty until the specifications were prepared.

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22021. But they might be altered at any time before the contract was signed?—The system adopted was to print the specifications and to print the contract too, so that the contractor or contractors would know exactly before tendering what contract they would have to execute, and these cases—these latter cases particularly, if not in every case in the Pacific Railway—the contracts were printed and exhibited to contractors before putting in tenders.

Witness out of the country when the disputes arose as to the measurement of muskeg.

22022. The dispute between the contractors and the Government, or at all events the difficulty of measuring this muskeg material on some proper basis, came to your knowledge while you were Chief Engineer of the Pacific Railway?—I explained to you, in some previous evidence, unfortunately I was not in the country. As soon as I returned to the country and discovered there was a difficulty, I gave orders that no further certificates should be issued in the contractor's favour until we ascertained what the nature of the difficulty was.

22023. Could you say about what time you first knew of it?—Yes, by referring to a letter which I wrote. It was about the end of 1878. I have sent for the letter.

22024. You have spoken of the system of measuring the quantities left in the work instead of those actually excavated; it is generally understood, I believe, that rock makes a larger quantity in the embankment than its cubic contents before it is excavated?—It does.

Rock always measured in excavation.

22025. What is the rule about rock: is that usually measured in excavation?—Yes; that is always measured in excavation—always.

22026. Why is it that it is not measured in the embankment?—Because it can be very readily measured in excavation. The muskeg material, I hold, cannot be accurately measured in excavation—it cannot be measured at all.

22027. Then, do I understand your objection to measuring it in excavation to rest on the impossibility of measuring the quantity excavated?—Yes; my objection to measuring muskeg excavation or to measuring anything else.

22028. Do I understand you to say that when this first came to your knowledge, I mean the difficulty of measuring muskeg material, that you instructed the engineers under you no longer to permit it to be measured in that way?—I at once took steps to ascertain the precise nature of the difficulty, and gave positive instructions that no certificate thereafter should be issued in the contractor's favour.

22029. You mean based on the quantity of muskeg taken out?—Yes.

22030. Is there anything further that you wish to say connected with this question of muskeg measurement?—Nothing now. I shall be happy to read the letter or letters when the letter-book arrives.

Surveys.

22031. We should be glad if you would explain more fully than you have yet done the system of surveys adopted from the beginning, say at first in the eastern section?—I shall endeavour to explain to the Commissioners some of the reasons which led to the adoption of the particular mode of survey which was carried out. In doing so, I may not be strictly accurate as to dates and matters of detail, as my memory may not serve me, and as nearly all the early records which would assist my memory were destroyed when the Pacific Railway Offices

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were burned in the winter of 1873-74. I have, however, found a few of the early records by which I will be enabled to give some dates and other particulars—some records that happened to be placed in an iron safe and escaped the flames. [Here witness as on the previous occasion when he made an extended statement read.] I have already, on my first day's examination, referred to my early connection with the undertaking. I mentioned how I was appointed to the office of Engineer-in-Chief. I stated that I was then Chief Engineer of the Intercolonial Railway, then in process of construction through the Provinces of Quebec, New Brunswick and Nova Scotia, and the work was being proceeded with generally and required very close attention. Having accepted the additional duty of Engineer-in-Chief of the Pacific Railway, it became necessary to take the most prompt and energetic measures which it was possible to adopt. The service was an exceptional one. The work was of gigantic magnitude: it was beset with difficulties of no ordinary kind, and the circumstances demanded that positive and reliable information should be acquired with the least possible delay. I can produce no written instructions from the Government to show the Commissioners what my duties generally were, or how my proceedings were to be conducted, as I received none. I was simply informed that by the Terms of Union with British Colombia a railway had to be established from the Pacific coast to connect with the railway system of the older provinces, and that the Government had undertaken to commence its construction simultaneously east and west of the Rocky Mountains within two years. When the conduct of the survey was entrusted to me, no point on the whole of the intended line of communication was fixed—not even the termini. The whole question was open. The problem was to find a line for a great national railway from some undefined locality on the 500 miles of sea-board of British Columbia across a continent, through great ranges of mountains, vast wildernesses and interminable forests to the valley of the St. Lawrence. The limits within which the examination had to be made and the railway established, ranged from 300 to 500 miles in breadth, and in length not far short of 3,000 miles. Nearly the whole of this country was uninhabited; much of it was trackless and unknown. The western section has been described as a "sea of mountains;" the eastern section a forbidding territory, in great part broken and interspersed with lakes, swamps, rocky ridges, and the whole surface a dense forest of an interminable character. The task was rendered unusually difficult by the severity and length of the winter, which greatly reduced the period left open for ordinary surveying operations, and it was further enhanced by the limited time prescribed by the Terms of Union. It was after Parliament had risen in the spring of 1871 that I was called upon to undertake the work. I felt the grave responsibility that was thrown upon me, and I determined to spare no effort to meet the wishes of the Government in as satisfactory a manner as possible. Not a day was lost: every scrap of information respecting the vast territory that could be obtained was considered. Every document was carefully read, every map earnestly studied in order to determine the plan of operations best calculated to accomplish the end in view, and most expeditiously attain the desired results. The physical characteristics of the country to be traversed enabled me to pursue the work of surveying under three grand divisions. The central division, being for the most part open prairie, presented little diffi-

When witness took charge as Engineer-in-Chief of Canadian Pacific Railway, was merely informed that a railway had to be established from the Pacific coast to connect with the railway system of the older provinces.

Difficulties: western section described as "a sea of mountains," the eastern section a forbidding territory much broken.

Pursued the work of surveying under three grand divisions eastern, central and western.

Surveys.

culty, and the examination in that region was a comparatively easy one. The eastern and western divisions were of a totally different character. I shall first refer to the eastern division extending from Manitoba to the River Ottawa, in length about 1,000 miles. It will not be necessary to enter into details respecting its physical features, as its character is fully described in my various printed reports, to which I beg to refer. Had the eastern division been at all like any ordinary country through which railways have been projected, I would have followed the usual course by making a general reconnaissance throughout before commencing an instrumental survey, but the circumstances were so entirely different from ordinary cases that I found this impracticable, and for several reasons another course was determined on. Even if it had been practicable to make such a general examination, it was impossible to obtain at that time the services of a sufficient number of properly qualified engineers to do it—those whose examination would be of any real value. I felt that it would be only a waste of time and money to make the attempt. My own experience in making preliminary explorations for the Intercolonial Railway confirmed me in the opinion that it would be fruitless and lead to great disappointment. The proper men were not available. It was utterly impossible for me to assist in it personally, without neglecting other duties, and I state this on the assumption that the ordinary course was the best, but the country was not accessible as ordinary countries are. There was not a road or a trail through the greater part of the forest. The character of the timber rendered the forest unusually dense. Away from the canoe routes, few of which were known to lead in the proper direction, there was only one way of piercing the country, namely, by means of the axe and hard labour; and as the use of the axe to force a passage through the woods became absolutely necessary, I felt it would add but little to the expense while it would add immensely to the value of the work, to follow the axe with actual measurements, chaining and levelling. I decided, therefore, after the most careful consideration of all the circumstances, that it was expedient to make a connected series of traverse surveys from end to end of the country, and to have the traverse line levelled at the same time so as to form a base for further operations, and give us positive information as to heights and distances which could be implicity relied on. It will be borne in mind that the greater part of the country was unknown. The canoe routes of the Hudson Bay Co., or some of them, were roughly laid down on maps, but beyond these routes the country was literally a *terra incognita*. It became necessary at whatever cost, to penetrate the whole country and discover the nature of the intervening districts. The traversed line had this grand object in view: it would give us the topographic features of the country along the desired route; it would give us the exact position of every leading obstacle; it would enable us to lay down on the map the position of favourable or unfavourable sections, not only on the line itself, but on either side, as the engineer would explore in every direction to the right and left. Thus we would be in possession of positive information of the most valuable character, and we would find out where a railway line could subsequently be laid out by avoiding the obstacles discovered, and taking advantage of the favourable sections of country, all of which would be accurately shown on the plan. Exploring parties, with a sufficient number of instrumentalists, were accordingly organized to enter the territory from every accessible point. I aimed at having these parties of sufficient strength and sufficiently

Eastern division from Manitoba to the River Ottawa, 1,000 miles in length.

Experience on Intercolonial Railway confirmed him in the opinion that preliminary explorations would lead to disappointment.

Decided therefore to have instrumental surveys.

Advantages of traverse surveys in a wooded and unknown country.

Surveys: 1871.

Aimed at having parties of sufficient strength and sufficiently equipped to perform the arduous work.

equipped to perform the arduous work assigned to them, and prevent failure in obtaining the required information with the greatest possible expedition. I also attached great importance to having these parties sufficiently provisioned to prevent disaster to those engaged. Considering the nature of the country and the climate, the responsibility of keeping a party supplied with bare necessaries, was no light one, and the cost of conveying supplies of food to the interior of a roadless country was immense. Here I may mention that, notwithstanding all the precautions taken, disasters least looked for overtook some of our men. During the summer of 1871, fires were raging in the woods north of Lake Superior, and through these fires seven men, engaged in the transport service, lost their lives. Thus we went to work at the commencement of the survey. I knew of no other plan, and I do not now know of any other means better calculated, under the circumstances which then obtained, to give results that could be considered in the least satisfactory. We boldly made the attempt to cut a way through the forest on the general course it was desirable for the railway to follow, and in the passage so cut to make all the measurements necessary to establish a base for trigonometrical and topographical and all engineering purposes. I need scarcely say that every officer sent out was specially instructed as to his duties and with respect to the grand objects of the examination. Each engineer in charge of a party was furnished with the means, and directed to explore the whole country on every side the traversed line, enabling him to fix the general position of every feature of the ground within the range of his observations.

Reads extracts from his **general instructions** to engineers.

In order to elucidate the system to the Commissioners, it may be well for me to read some extracts from my printed general instructions, which are dated May 24th, 1871. I shall pass over to the 8th clause. They are as follows:—

Engineer to be at head of party every day.

"In conducting the survey the engineer of a party is expected to be at its head every day, exploring in front and to the right and left of the line, in order to see what obstructions may be in the way of the same, and, if serious, deciding as to the best manner of avoiding them.

Transit men not to be far distant from a practicable line.

"It is not expected that the first survey through wooded districts will, as a rule, be the best position for the railway; it will, however, be the aim of the engineer in charge to have the 'transit line' far distant from a practicable railway line. The 'transit line,' on which the measurements are taken, will form a base on which to project an approximate section, and the engineer in charge, by noting the features of the country on both sides of the lines, will be able to make an approximate section as the survey proceeds.

Engineer to take barometric elevations of the ground.

"In many cases it will be desirable for the engineer in charge, while making his daily explorations, to take barometric elevations of the ground, noting by estimation the approximate position of the points of observation in relation to the 'transit line.' These elevations should be reduced afterwards to the datum of the survey and marked upon the plan in their proper position. This, as well as the general features of the country, should be marked upon the plan every day, while the whole is fresh in the memory. The barometric elevation will answer for rough cross-sections, and be useful in determining on the plan the position of the approximate location line, and also in compiling an approximate section of the same.——"

Which, of course, was done—

Must have two barometers, one to carry; the other to leave in camp.

"The engineer in charge must have two barometers, one to be carried by himself, the other to hang in camp; the cook, if moderately intelligent, can in a short time be instructed to observe and record its readings, and he should do so regularly at every hour of the day. By this means the engineer in charge (who will note the time when his own observations are taken) will be able to correct roughly all his observations, ascertain by comparison the height of each point above the camp (this being known), and thus be enabled to reduce all to the level above the datum of the survey. Barometers will be furnished by the Government

To furnish himself with climbers so as to climb trees to observe the country.

"The engineer in charge will find it of great service while exploring to carry with him light steel climbers, made to enable him to climb a tree with facility. By this means he will frequently be enabled to obtain a good knowledge of the topography of

the surrounding country and take such general observations and bearings as may be useful in directing the survey. A pair of climbers will be furnished with the stores for each party."

I read those to show that it was intended to have as useful a survey as could be made, not simply one which would give us the exact heights and distances on the line cut through the woods, but give us a good knowledge of the character of the country within the range of observation, wherever the engineer felt it expedient to direct his attention. The whole distance from the River Ottawa to Red River was divided into eleven different sections, each ranging, according to the circumstances, from seventy-five to ninety miles. An equal number of surveying parties were organized for the work of examination, and they were despatched as soon as the rivers were navigable to points as near the scene of their labours as could be reached. In some cases the short summer was half over before anything could be done on the line of survey, the time having been spent in travelling and in taking forward necessary supplies. It became necessary, therefore, to make early provision for a winter campaign, and to forward sufficient supplies of food and clothing to enable the surveying parties in remote places to remain out and endure the rigours of winter in a country without inhabitants and destitute of food and shelter. I may refer to a letter on that subject which I found. I may here read a letter which I addressed to the Minister of Public Works, Hon. Mr. Langevin, on the 27th of July, 1871, on this subject:

The country from the River Ottawa to Red River divided into eleven sections ranging from seventy-five to ninety miles.

Summer in some cases half over before any work done, and it was necessary to provide for a winter campaign, hence letter to Minister.

"OTTAWA, 27th July, 1871.

"Hon. H. L. LANGEVIN,
"Minister of Public Works.

"SIR,—I desire to bring under your notice some matters respecting the future operations connected with the Pacific Railway survey. You are aware that no time was lost in organizing and despatching the various surveying parties, and that everything was done with a view of placing the Government in possession of as full information as possible respecting the country to be traversed by the railway before the next meeting of Parliament. After the surveying parties left for the field of operations a good deal of difficulty and delay was experienced in getting the men and supplies transported. This delay, through causes which need not now be entered into was unavoidable, and has shortened the period for actual work considerably. Some of the parties in remote districts will scarcely begin work before the end of this month, ——"

That is July—

"And in order to enable them to return by the close of navigation, they would require to leave for work about the 10th or 15th of October, thus leaving only some ten weeks for actual surveying operations, a period altogether too short to accomplish all that is required. The cost of transporting the various parties to their destination is very great; the necessary material and organization for forwarding supplies is now provided, and work can be carried on through many sections of country more rapidly and at less expense in winter than in summer, provided supplies are sent in during the season of navigation. I would, therefore, under all the circumstances, respectfully recommend that I be authorized to continue such portions of the survey during the winter as may seem advisable, and that provision for winter service may be secured in good time. I may state that the expenditure up to the present time has been $50,000, and liabilities entered into to the extent of $30,000, making $80,000 in all. This is at the rate of about $40,000 per month, but as much of this is for the purchase of equipment, supplies and transportation, the rate of expenditure will be somewhat less. From the above, it would appear that the appropriation by Parliament will not be sufficient to carry the survey over the winter; but in my opinion it would be highly inexpedient to withdraw the parties until they complete the object for which they have been organized, and a large portion of the expenditure would have to be incurred again in spring in preparation and in transportation upon recommencing the survey next season.

In many sections work could be carried on at less expense of time and money in winter.

Expenditure $40,000 a month, but in future would be less.

"I am, &c.
"SANDFORD FLEMING,
"Engineer-in-Chief."

Surveys: 1871.

Then there is a letter to Sir George Cartier on the same subject, I think.

22032. And, I suppose, to the same effect?—Yes.

Wrote to Sir George Cartier, for the purpose of arranging for the steamer *Rescue*.

22033. Which is recommending winter survey and money to be provided for it?—He was Minister of Militia at that time, and it was for the purpose of arranging for the steamer *Rescue*, under the control of the Militia Department. Many difficulties were met with, and every effort was made to overcome them. During the winter, advantage was taken of the frozen lakes, and rivers, and swamps, to make extensive explorations with barometrical measurements, in order, by this means, to obtain a better knowledge of the country in advance of future instrumental surveys.

Winter explorations without levels and chains, but distances and elevations were ascertained.

22034. Those explorations in the winter, as I understand it, were without instruments?—They were without what were usually used for making surveys. They were without levels and without chains, but the distances and elevations were ascertained by means of the barometer, and other means—other simpler means. Winter explorations of this kind were made through the country extending from Red River easterly as far as Nipigon; also for long distances east of Lake Nipigon and north of Lake Superior—indeed, wherever it seemed necessary and practicable. Within a year after assuming the direction of the survey, and notwithstanding many hindrances and difficulties which were wholly unanticipated, I was enabled to report to the Government results which were, at the time, acknowledged to be highly satisfactory. I would wish to read one or two paragraphs from my report of the 10th of April, 1872. I find the results there given in very condensed form:

Progress of survey in 1871, as described in witness's report dated 10th April, 1872.

"Some general observations respecting the progress made in the prosecution of the survey may now be submitted.

"Full detailed information may be had on reference to the reports and documents which accompany this. It has been found impossible to maintain regular communication with many of the parties engaged on the survey during the winter, but, judging from the progress reports last received, the undersigned feels confident in stating that the surveys projected in June last between Mattawa, on the Ottawa, and Nipigon Bay, on Lake Superior, are now, with one exception, completed, and that only two breaks in the survey exist between Nipigon Bay and Fort Garry.

"No serious engineering difficulty has been met with in passing from the valley of the Ottawa to the country north of Lake Superior; it is impossible, however, to speak so favourably of the country covered by divisions G and H of the survey, embracing over 100 miles easterly from the River Nipigon. This section is excessively rough and mountainous, and the survey made through it did not result in finding a practicable line for the railway.

"West from Nipigon River to Fort Garry, although two divisions of the survey are incomplete, enough is now known of the country to warrant the belief that it will admit of a practicable line with favourable grades for the greater part of the distance.

"Explorations are now being made with the view of ascertaining how far it may be practicable to avoid the very serious difficulties referred to on divisions G and H, by running the railway line further in the interior; it has already been found that the rocky and broken country, which presents itself on the shore of Lake Superior, changes very much at a distance of fifty or sixty miles to the north, and from what has been learned, it is thought that a perfectly practicable line will be discovered by the north side of Lake Nipigon. Definite information on this point cannot be received before navigation opens between Collingwood and Lake Superior, when the parties engaged on the exploration are expected to return; but the line drawn on the map by the north side of Lake Nipigon, shows the general direction in which, from the very latest information received, a practicable and favourable line may be confidently expected.

"The survey and exploration made from Sault Ste. Marie easterly along the northern shore of the Georgian Bay towards Lake Nipissing, establish the fact that a good line can be had with very favourable grades."

22035. We are, of course, very glad to record that again, which has already been mentioned in your report of 1872, but our main object in asking these questions is to ascertain in detail the system which was adopted, and the reasons for it, not so much the results which were obtained from the system, because those are all very fully reported?—Perhaps you will allow me to finish the few words I have to say. Witness proceeds with his statement.

22036. Certainly, we have no objection to hear whatever you think is material, after calling your attention to the object of the question? – I will add to the foregoing, respecting the mode of survey adopted, a letter addressed to the Minister of Public Works on the 6th of May, 1872, while Parliament was in Session. Mr. Langevin was then Minister of Public Works, and the letter will explain itself. It is given at page 77 of my first report. I read this letter to show you how matters stood at that time. You will see as I go on that it bears on the question that you ask:

Letter to Minister of Public Works, as published in appendix to witness's report of 1872, in which letter he defends the **point selected** for beginning the easterly section of the survey.

"Canadian Pacific Railway,
"Office of the Engineer-in-Chief,
"Ottawa, May 6th, 1872.

"The Hon. H. L. Langevin, C. B.,
"Minister of Public Works, &c., &c.

"Sir,—Objections have been offered, since my report on the Pacific Railway explorations was made public, to the point selected for beginning the easterly end of the survey. It is, therefore, proper that I should submit a few words of explanation, which, if you deem expedient, may be included in the appendices to the original report and printed with them.

"In the selection of a point for beginning the survey, three main objects had to be kept in view:

"1st. A connection with the railways of the Province of Ontario.

"2nd. A connection with the railways of the Province of Quebec.

"3rd. The discovery of a practicable line for a railway through the wilderness country extending northerly and westerly by Lake Superior to Manitoba.

"The Government considered that a point between the Georgian Bay and the River Ottawa in the latitude of Lake Nipissing, would generally meet the first two objects, viz.: the connection with the existing railway system of the country.

"The third object appeared, at the time the survey began, the one of chief importance, as grave doubts were entertained by many as to the possibility of piercing the long extent of rugged country, believed to exist, with a practicable line for the railway.

"The Government was extremely anxious that a practicable line should be discovered with as little delay as possible, and, in order the more effectually to accomplish this object, the engineer appointed to conduct the surveys was left untrammelled as to the course to be pursued.

"The Government simply decided that the survey should begin in the latitude of Lake Nipissing somewhere between the Georgian Bay and the River Ottawa; the duty and responsibility of finding a practicable line thence westerly devolved upon me.

"The distance between the Georgian Bay and the River Ottawa in the latitude referred to is, in round figures, about 100 miles. Lake Nipissing is situated about midway, and, with its different bays, practically occupies about fifty miles, or about half the whole distance.

"It was clear that a line for the Pacific Railway, to connect with the railways of Canada to the south, must pass either to the east or to the west of Lake Nipissing.

"Every known source of information respecting the country lying between Lake Nipissing and the northern bend of Lake Superior was fully and carefully consulted by me, and all accounts agree as to the exceeding roughness and impracticability of the country for railway construction on a line drawn from any point between the Georgian Bay and the west end of Lake Nipissing.

"The country on a line drawn up the valley of the Ottawa from a point east of Lake Nipissing seems, on the other hand, much more promising.

"I satisfied myself that to attempt the discovery of a favourable line on a moderately direct course from the westerly end of Lake Nipissing to the north side of Lake Superior could only be made at a great expenditure of time and money, and without much hope of success.

"My duty and object was not to court failure, but to aim at success by the most direct course, I therefore decided to look for a satisfactory solution to the problem of practicability by beginning the survey at a point east of Lake Nipissing. * * *

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"I am perfectly satisfied, from all the information acquired respecting the geographical position of the different points referred to, and the physical features of the intervening country, that the probability of finding a more favourable and shorter line, by the west side than by the east side of Lake Nipissing, is very small.

"Be this as it may, I trust the explanations given with regard to the commencement of the survey are satisfactory. Of course, in beginning instrumental examinations it was necessary to fix on some definite point. I selected Mattawa as this point for similar reasons to those which governed me in making the survey east instead of west of Lake Nipissing.

"I do not, however, wish it to be understood that I consider it impracticable to build the railway nearer the east end of Lake Nipissing than Mattawa, and thence to such point south of it as the Government may select.

"I have the honour to be, Sir,

"Your obedient servant,

"SANDFORD FLEMING,

"Engineer-in-Chief."

Reads from his report of 1874, description of **results in the woodland region.**

Then, for an explanation of what was done up to the time of the fire in 1873-74, I refer to my report for the year 1874, page 27. I shall read part of page 27 of my report of 1874:

"In accordance with the principles laid down at the beginning of the survey in the spring of 1871, the first efforts were directed to the discovery of a route for the main line which would touch Lake Superior at such a point in its course as would make the prairie region accessible from that lake during the season of navigation.

"The first efforts were not successful. The work of exploration, extending over a whole season, with a strong staff of surveyors, although undoubtedly the means of acquiring a great deal of reliable and important information, did not result in the discovery of a practicable line throughout.

"Explorations were continued during the following winter and summer, and by the end of 1872, a practicable and favourable route for the main line was found.

"The route passed round the north side of Lake Nipigon, and in order to connect it with the navigation of Lake Superior, a branch line was rendered necessary.

"Two surveys for the branch were made. The one to Thunder Bay, the other to Nipigon Bay. The estimated distance from the main line to the former point was about 150 miles, and to the latter point about 105 miles.

"The position of the main line, north of Nipigon, involving the construction of so long a branch, was not satisfactory. Surveys were therefore renewed in the spring of 1873, in the hope of finding a more suitable location. It was felt that the saving effected by a reduction of the length of the Lake Superior Branch would compensate for the extra cost involved in passing through a portion of difficult ground. It was known that the rugged district along the coast of Lake Superior could not wholly be avoided, but it was expected that exhaustive surveys would result in showing where the fewest difficulties would be encountered.

"While five surveying parties, fully equipped, were engaged in this examination, the country between the valley of the Ottawa and Lakes Huron and Superior was further explored, with the view of projecting the most direct practicable route from a point east of Nipigon to the westerly and to the easterly sides of Lake Nipissing.

"During the present winter two surveying parties have been and are still at work west of Lake Nipigon, but the characteristic features of the district in which they are engaged are well understood, and I do not apprehend they will meet with much impediment. Their duty is mainly to connect previous surveys by a chain of measurements, in order to shorten distances. This work, as much of the ground is marshy and broken by innumerable small lakes, can best be done in the winter season."

For work done on eastern section refers to page 46, of report of 1877.

I do not think I need trouble you with any more. Then, again, there is something in my report for 1877, that bears on this particular subject, page 46. In my report for 1877, I give a detailed account of the operations in the eastern section, year by year. I do not know that I need read it, but I would refer to page 46, where this description begins.

Thinks that extracts from his report have some bearing on the system that was projected for examination of the country.

22037. We have had the advantage of that report and of reading about those different operations for the several seasons, but if there is any particular part which you wish to record in the evidence, we have no objection to hear it read: it is for you to say whether you consider it material or not, under the circumstances, understanding that at present we are endeavouring to ascertain the system that was projected for the examination of the country, and the reasons for it?—Well, an

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account of the operations will probably give some indication of the object of the surveys.

22038. I think we understand generally the object of the surveys, which, I suppose, was to get as full information as could be reasonably got, under the circumstances, for the purposes of the railway; however, if you desire that any particular portion of these reports should be recorded expressly by way of evidence, we cannot object?—Well, I would simply refer to my various reports, and especially to page 46 of my report for 1877, describing the operations in the woodland region, year by year, and I would like to read about half a page of that which bears on the difficulties, at all events, connected with the survey:

Reads from report of 1877, descriptions of operations in woodland region.

"At the beginning of the survey, a large extent of this region was but little less strange than the Mountain region. No civilization, so far as known, had ever passed from the valley of the Upper Ottawa through the intervening wilderness to Lake Superior. The country east and west of Lake Nipigon was all but a *terra incognita*. It is true that the chain of lakes and streams from Thunder Bay to Lake of the Woods and Fort Garry, known as the Dawson route, had beeen travelled, but this route was circuitous and much out of the way of a direct railway line.

"All accounts of the country to be traversed by the railway, at least such portions of it as were in any way known, were unfavourable. The southern margin of this region extends for some 600 miles along Lakes Huron and Superior, where the eye rests upon only a continuous frontier of rugged rocky hills, and on the more northern lake they assume the form of bold bluffs of great height rising from the water's edge. The surface is generally wooded. In many places dense thickets are met. Judging from an exterior so rough, and general features so forbidding, the region was deemed by many impracticable for railway construction.

"The first step was to pierce the interior by a chain of connected explorations and actual measurements, both of distance and height.

"These operations were commenced at Mattawa, a point on the River Ottawa, in the latitude of Lake Nipissing, to which locality exact surveys and levels had, some years previously, been carried from the tide-water to determine the construction requirements of an Ottawa ship canal. Strong parties, eleven in number, were detailed to carry on the required operations from Mattawa west to Red River, a distance exceeding 1,200 miles.

"Great efforts were made to have these surveys connected within the year, but the vast distances which intervened through an entirely roadless, and in some places exceedingly rough country, made it late in the summer before portions of the survey could be actually commenced. The difficulties in the way of keeping the parties furnished with supplies was also great."

I turn to page 57 of the same report and read:

"The topographical features and the adaptability to railway purposes of a country covered with woods, and imperfectly known, can only be ascertained by patient and persistent efforts. The view is much obstructed by the growth which covers the surface. The axe must generally be used to admit of observations being made for even a few hundred feet. The way must be felt little by little.

"The woodland region is covered by dense forests throughout its length, of more than a thousand miles from east to west, and in its breadth from the Great Lakes north to Arctic waters.

"It is entirely without roads of any description; the examination has, consequently, proved difficult and tedious. Exploratory lines have been carried through the forset in every direction where the determination of facts suggested their necessity. Thus, at great labour, we have acquired valuable information, and the results may be viewed with satisfaction."

22039. I understand that you were untrammelled as to the course which you would take in making any examination of the country?—Yes; I made use of that language. I had no instructions. I explained my views from time to time to the Minister of the Department, and he usually concurred in the proposals which I made.

Witness untrammelled as to the course to be taken.

22040. Do you remember whether you had any positive instructions as to the time when the work would be actually commenced, or whether you assumed that the time named in the agreement with British Columbia would be the time within which they would be commenced?

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—I had no written instructions, and I do not remember what verbal instructions I had, if I had any; but I certainly understood that the Government desired to have the information within the time named.

22041. Could you say whether you understood that from any officer of the Government, or whether it was your own conclusion from reading what had been written on the subject?—I understood that in all my intercourse with the Minister of Public Works, and I think the letters which I have read to-day will show that was my conviction.

22042. I have understood it to be your conviction, but I am endeavouring to ascertain now, how you reached it—whether you say it was communicated to you by some one on behalf of the Government, that two years was the limit of the time that would elapse before the work commenced?—I understood that.

If he had not understood that the work should be commenced within two years he would have pursued a different system from what he did.

22043. From some one connected with the Government?—From some one connected with the Government.

22044. If the time had been much longer, say double that, would it have made any difference in the course which you pursued in making these examinations?—Yes; it would have made considerable difference.

22045. Would you explain what difference it would have made?—In some places it would have made not much difference. I think it would have been absolutely impossible to pierce that portion of that uninhabited and roadless country but in the way it was pierced; but there are other places where, in all probability, I would have attempted to make a personal examination myself.

22046. Then that difference would only have been in the persons who were engaged, not in the system of survey, do I understand you to say?—In both. I say there are some places where there is no other way of getting the desired information. I do not know any way in which you could make a general examination of the country that would be of any value between the Ottawa and Lake Superior on the route of the railway unless it was made by an exceedingly able man, such a man as was not available at that time. You must bear in mind, in a country of that kind, densely wooded, it is very much like groping in the dark: you cannot see 100 yards about you. In my instructions I suggested each man should carry climbers with him to get information in that way that he could—climbers such as telegraph constructors use to put up wires.

22047. Then, if the time had been much longer than two years, do you say you would have adopted a different course?—If the time had been much longer than two years I would have adopted a different course in some sections.

22048. Which sections?—North and west of Lake Superior.

If there had been time would have made explorations first, and then proceeded to make instrumental surveys on promising routes.

22049. What different course would you have adopted?—I would have attempted to make the examination by means of the micrometer and barometer along the various canoe routes and lakes that intersect the country in many directions to the west and north of Thunder Bay.

22050. With what object would you have adopted that particular course?—For the purpose of getting a general, although not strictly accurate, knowledge of the country.

22051. How would that have been any benefit to you?—It would have enabled me to project surveys.

22052. Instrumental surveys?—Yes; on routes which were the most promising—which seemed most promising.

22053. Then, if there is no particular objection in the surrounding circumstances, to have a preliminary examination is the best course?—That is the plan that I would have adopted.

22054. I understand you to say that is the best plan where there is not something in the surrounding circumstances to prevent it being adopted?—Yes.

22055. How does an instrumental survey accomplish the object better than the other method when the time is short?—An instrumental survey combines both. It gives you the information that you would derive from that means, of making an exploration, as well as positive information of another kind with regard to horizontal and vertical distances, and it gives you a base from which to project your explorations to the right and left.

From Nipigon to the Ottawa, an entirely unknown country.

22056. I understand that this was a new country altogether; that it was unknown, in fact, to civilized man, as you put it—the country generally from Red River to Nipissing?—More especially from Nipigon to the Ottawa. The Dawson route had been traversed at various times, and it is well known the Dawson route extends from Lake Superior to Red River.

22057. But from Nipigon direct there was not much information obtained?—Not much.

22058. Speaking generally of the country, from Lake Nipigon to Lake Nipissing, it was an unknown country?—Speaking generally; yes.

The country north of Dawson route unknown.

22059. The exception to that general description is that portion which would be a little south-west of Lake Nipigon, along the Dawson route?—Yes; the country along the Dawson route—the country north of the Dawson route was not known.

22060. Would it be desirable, before laying out a line in an entirely unknown country, to get some kind of information over a large area, or over a limited area?—We acquired as much information as we could over a wide area. I had an exploration made on snow shoes, without instruments, all the way from Red River east to Nipigon, as early as it could be done.

Where a line is to be made over an entirely new country desirable that the examinations should cover as wide an area as possible.

22061. That is what was done; but speaking now in the abstract, without reference to any particular work, and from an engineering point of view, where the necessity is to make a line over an entirely unknown country, is it desirable that the examination should cover as wide an area as possible, or a limited area?—Oh, as wide an area as possible.

In this case a very wide examination not so necessary as the shortest possible line from Lake Nipissing to the northern bend of Lake Superior was required.

22062. Would you get information over a wide area by employing this method which you have described as the one which you would have taken if time had not been limited—I mean by micrometer and barometer—rather than by an instrumental survey?—Well, you must be guided by every circumstance. In this case there was no need for getting information over so wide a country as your question would indicate, or seem to mean. For instance, we wanted the shortest

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line from Lake Nipissing, or that neighbourhood, to the northern bend of Lake Superior.

22063. You mean the shortest possible line?—The shortest possible line. There is no need for making an exploration 200 or 300 miles from that, although we actually did send an expedition through to James Bay for another purpose altogether.

22064. I understood you to allude to the great width of this country you had to examine; after describing the length, you mentioned 300 to 500 miles, I think?—Yes; that is on the Pacific coast, and that was actually examined; but on this end I did not mention so great an area, did I? Although I would not have been so far wrong, for I made an exploration as far north as James Bay by order of the Government for another purpose. In speaking of that I had reference to the cause of expenditure on the survey.

22065. Was it desirable between Red River and Mattawa, or Nipissing, to obtain information over a wide or a narrow area of country: I am speaking now of the breadth rather than the length?—Well, it was desirable to get as much information as possible.

22066. You mean over a wide area of country?—In every direction; but it was more important to get information as to the practicability of a line on the shortest course between the one point and the other.

22067. A short time ago I understood you to say that if you had not been limited to time you would have adopted, as a preferable mode to the one that was adopted, the method of examination by micrometer and barometer, because it would have given you the information over a wider area, and would have enabled you to judge on which of the lines you would afterwards make an instrumental survey?—Because it would give me the information which would enable me to project an instrumental survey with the best prospects of success.

Thinks, irrespective of time, it would have been necessary to pierce that country between Nipissing and Nipigon with instrumental surveys.

22068. Would not those same reasons have applied to the territory between Nipissing and Nipigon, for instance, if you had not been limited as to time?—Not to the same extent; no. I think it would have been necessary to pierce that country in the way it was done under almost any circumstances—at least I could see no other course calculated to result satisfactorily at the time.

22069. Do you say that as to that particular portion of the line between Nipissing and Nipigon, you would have adopted the course which you did, whether time was an object or not?—Over a considerable portion of it I think I would.

22070. Then your opinion is evidently that the course pursued was the best in the public interest?—I think, under the circumstances, that I could have pursued no other course.

22071. Under which circumstances?—Under the circumstances which I have explained in my evidence to-day.

22072. You do not mean the time arrangement with British Columbia?—That is an element.

22073. But I understood you to say that, irrespective of that element and under any circumstances, this would have been the best course?—Every part of the country.

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22074. Speaking of the part which you have just mentioned, do I understand you to give this opinion: that the method of examining that country which was adopted was the best one in the public interest under any circumstances?—Under the circumstances which obtained then. Under the then circumstances the plan of surveys adopted the best in the public interest.

22075. I thought you said, irrespective of those circumstances?—Taking the question of time; if three or four years had been given, I think the plan adopted was a good one for that portion.

22076. If time had not entered into the calculation at all; for instance, if it had been ten years instead of two?—Ten years would make a great difference. I would not have made such a survey the first year if ten years had been given. I would have adopted other means of getting the information in that case. If he had had ten years would not have made an instrumental survey the first year.

22077. What course do you say you would have adopted to get that general information to which you allude?—I would have sent exploring parties up the River Ottawa in order to make a micrometric and barometric observation. I would have done the same up other rivers, and in that way endeavoured to narrow the limits within which to make the kind of survey which was made. Would have sent out exploring parties.

22078. By sending out those exploring parties the first season you would ascertain where it would be expedient to send the other parties afterwards: is it desirable to obtain such preliminary information before sending out instrumental parties?—Yes.

22079. Why?—Because the object of the whole expenditure was to gain information.

22080. But if you could gain it just as well by an instrumental survey in the first instance, why would it have been desirable to precede it with such an expedition?—This could be done at less expense.

22081. That is the reason?—Yes.

22082. Then the loss, if any, by being obliged to adopt the system you did, was a financial loss?—Financial loss.

22083. Is there much difference in the expense between the two courses: in the first season an exploration, and afterwards an instrumental survey, over a selected line, and the course which you did adopt, namely, an instrumental one from the beginning?—I do not know, in the long run, if it would have been very much different, because the general survey would have cost the same, and would have been necessary in the long run. The only gain would be you would be more likely to meet with ultimate success by taking the other course. Does not know that there would be much difference in ultimate cost.

22084. I suppose it has happened in your experience of this very railway that some instrumental parties have performed services which have been entirely useless on account of their meeting with obstacles which were insurmountable?—Not entirely useless. The very fact that they discovered insurmountable obstacles was of value.

22085. The instrumental survey was useless, I suppose, if it could have been discovered in the way you speak of, by a micrometrical and barometrical survey?—If we had the proper men to do it. Witness's views of the comparative merits of exploratory and instrumental surveys.

22086. Then so far as that survey exceeded in expense the more simple one, to that extent it was useless in the instances I have alluded to, where they discovered the insurmountable obstacles?—If the obstacles could have been discovered at smaller cost it would have been very desirable to do so.

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22087. Is it not desirable to ascertain those obstacles by a simpler process?—Not always; the difficulty is to define the position—to lay the position down on the map.

22088. But there is no difficulty about that, is there?—There is a difficulty.

22089. Then why would you adopt such surveys if there is a difficulty about ascertaining the localities—in other words, if they are not effective?—I would adopt them in some instances where you could, with comparative ease, fix the position of the obstacles.

22090. Could you, in the country between Nipigon and Red River, without difficulty, fix the localities by micrometric and barometric observations?—It would not be very easy. That country, at least the geological characteristic, is very much like the Thousand Islands, only there is little more land than water, and it is very difficult to make a survey there.

The reason why instrumental surveys were adopted from the beginning was the limited time.

22091. I understand you to say this, at all events, that the simpler explorations give information which it would be desirable to get before starting instrumental surveys, and the reason why instrumental surveys from the beginning were adopted, was that the limited time made it necessary?—Yes, the time seemed to make it necessary. If I had been asked to make this survey with unlimited time I would not have taken the same course.

22092. Now, coming to the question of time with a view of ascertaining how far it affected the system of surveys, let me ask what extent of the country from the east you supposed would be under construction within two or three years from the time of the first survey?—From the east?

22093. Commencing from the east?—From Lake Superior to Nipissing?

22094. East of the whole line. I understand you to say that you were informed that the terms with British Columbia would be adhered to and that simultaneously the work would be commenced from the east and from the west?—Yes.

22095. That would make it appear necessary to commence the survey at each end; now, assuming that to have been necessary, how long do you think it would take to ascertain the point of beginning, and enough more to enable them to go on with the work?—Well, I see what you mean, and I think that it would have been impossible for me to pronounce positively as to the practicability of the whole line before the next meeting of Parliament, so soon, if I had not taken the course I did. It would not have done to have omitted the whole section between Lake Superior and Nipissing. It was necessary to ascertain whether it would have been possible to get a railway through that or not.

Necessary to ascertain the practicability of a line from end to end before a blow was struck.

22096. Do you mean that it was necessary to ascertain the whole of the route before either end was begun?—It was necessary to ascertain whether a line from end to end of the country was practicable or not before a blow was struck; that is my opinion.

22097. Then, in your opinion, the simpler examination of the country at any point between Red River and Nipissing could not have been attempted as a first step; it was necessary to adopt the more expensive

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system from the beginning?—It was necessary to take the means that would lead to a positive opinion one way or the other, and that means was taken. It is an easy matter being wise after the event, but I can positively say I could see no other way of having the results that were desired.

Necessary to take the means which would lead to a positive opinion.

22098. It is not because I have any doubt of your judgment in the matter, or what your judgment was at the time, that I am asking these questions; but it is in order, if possible, to get down to the reasons bearing on the matter, so as to see what led to your judgment?—Well, but pardon me, I am not referring to you. I know that some people are ungenerous enough to state what they would do after they know what the difficulties are. Some people are always wise after the event. I have no reference to any one here.

22099. I have taken the course of questioning in this way in order to get out a great deal more than a witness will say by merely stating what his opinion is at a particular time. We have to elaborate to get down the different views on the different questions which suggested themselves to your mind?—If I had to do it all again I would not say that I would take precisely the same course or employ the same manner of means of getting information, because I know better now; but, with the information that I had then, I know of no other course that I could have taken.

With the information witness had at the time he knows of no other course which could have been taken.

22100. Was there any portion of the country which had been under your direction before—I mean on the Intercolonial Railway or any other part of the country—which was an entirely unknown country at the beginning of a project?—On the Intercolonial Railway there were surveys made through large—considerable—sections that were very little known to any one who left a record behind them. They were probably traversed by lumbermen. Examinations had been made some ten or fifteen years before by Col. Henderson and his assistants in certain directions.

22101. How was the knowledge obtained before locating the line through that section: was it by exploration in the first instance?—Both plans were adopted.

On the Intercolonial both preliminary explorations and instrumental surveys in the first instance were adopted.

22102. Generally, which practice prevailed at the beginning in the examination of that country?—I am not very sure.

22103. Was it under your control at that time?—It was not under my control, but when it came to be under my control I adopted both ways.

22104. I am speaking now of entirely new countries?—I adopted both plans.

22105. I suppose in settled countries, or well known countries, where the physical features are understood, there would be no great necessity for explorations?—That is just the place where you could make them most easily. For instance, between this and Toronto there is no difficulty riding over it on horseback or driving through it by waggon and getting a fair knowledge of the country, but that could not be done where it is all forest, and it is all forest up there Where there is spruce, balsam, and such trees as that, it is very difficult to get through.

22106. I think I have learned, by your evidence to-day, that whenever you thought the opportunity occurred you did examine the country

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first by explorations and not by instrumental surveys, notwithstanding these trees?—Yes.

Why simple explorations were made in winter.

22107. Why was it advisable to explore simply in winter?—Well, it enabled you to get over some portions of the country a little quicker and at much less expense than by making an instrumental survey, and these explorations were not always, but generally side explorations, not in the general direction that we aimed at getting, but to gain information at considerable distances to the right and left of that line, so that if we failed in getting through in a direct course we could direct our attention to a roundabout course.

Witness asked to give cost of a bare exploration.

22108. You say that was a good deal less expensive than instrumental surveys: what party would be necessary for a bare exploration?—The chief expense would be in carrying in the provisions.

22109. And that would depend upon the number of the party of examiners, if I may so call them, as distinguished from labourers?—It would require a sufficient number to take in provisions, and that would depend on the distance they would have to go.

22110. Take any common distance you like, say fifty miles, what number of persons would you send to make the examination as distinguished from transporters and other labourers?—I would make an estimate of the number of days they would have to be away from the base of their supplies, and allow a pound and a-half of pork and a pound and and a-half of flour per diem.

22111. Could you make that up shorter, say for 100 miles?—If this object is simply to run along 100 miles and come back, the time would be short; but there are other circumstances probably requiring him not to go forward and back by the same line, but to take a circuitous course in order to widen the sphere of observation.

22112. Well, taking what matters you think necessary before making up an exploring party, would you now say what you consider the size of a party should be for north of Lake Superior?—Well, I will furnish the data on which I would make my calculations. These explorations would have to be made in winter.

22113. Say first for winter, by way of illustration?—And you would have to take into account clothing; they would want blankets, and some pots and pans, and a tent of some description.

22114. Of course a party would not be sent out on such an expedition without a calculation of some kind being made?—The calculation has been made over time and again. I cannot carry them in my mind.

22115. If you will give me the particulars I will make it up now?—I would allow a pound and a-half of pork and a pound and a-half of flour for each man;——

22116. How many men?—I think I would give them a couple of blankets, and I would allow a couple of buffalo skins among a certain number, and they would want a frying-pan for a certain number, and some pots and pans to boil pork and tea.

22117. Are there any other minutiæ you would like to describe?—Yes; they would want two tents, unless the engineer went out contented to sleep with his men. Then you would have to make allowance for accidents of various kinds, and the possibility of the party not

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returning so soon as expected, and have to take a surplus of these things with them to prevent any sort of disaster.

22118. Would anything else enter into the calculation?—Such instruments as they would want and their personal clothing They would want to take clean flannel shirts, drawers, socks, and boots and moccasins, and various things of that kind.

22119. Is there anything else that is absolutely necessary to mention before we can calculate?—I think these are the chief items. There may be small things which would suggest themselves to any one.

22120. Would you give me the number of men now?—The number of men would depend upon the result of that calculation.

22121. I asked some time ago how many persons you would take for the examining portion; I thought that desirable as part of the data?—Well, two would be enough. Two engineers enough for a simple exploration; two axe men.

22122. And for what other purpose would men be required?—For using the axe, and for carrying in these things on their backs.

22123. How many for the axe?—Oh, I should think a couple of men would be enough.

22124. Do you think the party would be composed of four, besides those who were required to do the transporting?—Possibly that would be about the number. It would depend, of course, a good deal upon the length of the journey and the object of the journey.

22125. I endeavoured, upon a former occasion from another witness, and I am endeavouring now, to ascertain something of the proportion of these two systems of survey, one by a bare exploring party, and one by an instrumental surveying party, and I find it is very difficult to get any one to express an opinion. I have no objection to making the calculation if you think it is too difficult, or if you do not remember. If there is any simpler way of getting at it I would like to know it for the purpose of this comparison. Of course we can start at any given distance—100 miles or fifty miles?—You would take, possibly, one of these surveys that were made in that way. There was one made, I remember, in the winter of 1871-72 by William Murdoch, between Fort Garry and Fort Nipigon. The number of hands with him and the cost incurred would probably give you some idea of the expense of that. That can be easily ascertained. Refers to the exploration of Murdoch, and suggests that the cost can be ascertained from the Department.

22126. Do I understand from you that in the Department of the Engineer of the Pacific Railway there is no general understanding on this subject, as to the relative cost of such parties and such examinations—that it is a matter on which there is no impression?—Well, here I am a witness under oath, and I do not come here prepared to make calculations under oath. I would like to do it deliberately if there is any need for doing it. Does not come prepared to make calculations under oath.

22127. It is desirable to get this information?—I do not see the object. I do not see that I am called upon to be bothered with it, to speak frankly. Not called on to be bothered to give information on the relative cost of different modes of examining a country.

22128. Well, I am very sorry to bother any witness, but I cannot help feeling it is a matter we ought to get information upon, if it is possible for engineers to ascertain it: is there any person else you could suggest who would do it better?—Well, I suggest an actual case. Take the case of William Murdoch, who made that examination—pre-

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cisely such an examination as you are enquiring about, between Fort Garry and Lake Nipigon; or, take the case of William Armstrong, who made an examination by the River Pic and down Nipigon River; take the case of Mr. Austin, who made an examination from one part of the country to another to the east of Lake Superior.

22129. These were exploratory examinations, I understand?—Yes, these were exploratory surveys.

22130. With what instrumental surveys should I compare those exploratory examinations?—I do not think it would be just to compare them with any instrumental surveys.

Cannot tell how cost of instrumental and exploratory surveys may be compared.

22131. How can I compare the cost with that of instrumental surveys?—I do not know; I cannot enlighten you. I thought it expedient to make instrumental surveys at first.

22132. Of course you have no objection to my getting data for the comparison?—Not at all.

22133. You understand I am endeavouring to make a comparison between a bare exploration over a common country and an instrumental survey, such as was made from time to time over different parts of the country: now you suggest those very exploratory surveys as comparing the data?—If I had thought such an exploration would have procured the information, I certainly would not have gone to the expense of doing anything more.

22134. I am quite sure that you did not think so, and that you took the course which you deemed to be best; but after disposing entirely of that matter, I wish now to get some data on which to found a comparison of the cost of such surveys without reference, if you like, to the Pacific Railway. We want to know what it would cost to survey such a country as that through which the Pacific Railway was located, in the one case merely by exploration, and in the other case by an instrumental survey?—I am afraid I cannot assist you in making the comparison at this moment. After reflection I might.

OTTAWA, Saturday, 14th May, 1881.

SANDFORD FLEMING'S examination continued:

Railway Construction—Contract No. 25. Muskeg.

By the Chairman:—

22135. Is there anything connected with your previous evidence that you wish to state?—In my evidence, yesterday, respecting the measurement of muskeg, I stated that I had written a letter directing that all further certificates should be stopped. I have sent for the letter, and here it is, dated December 23rd, 1878. It is quite short:

Letter of Fleming to Smith directing that all further certificates should be stopped.

"MARCUS SMITH, Esq., Ottawa:

"MY DEAR SIR,—On the 12th instant, Messrs. Purcell & Ryan, the contractors for section 25, made application for the percentage retained by the Government on their contract. I looked into the matter, and found that while the original total estimated amount of work was $1,037,061, already $1,312,015 had been certified as the value of the work executed, showing a serious discrepancy between the original estimate and the return of work done, too serious, indeed, to pass unnoticed. I at once telegraphed Mr. McLennan, the engineer in charge of the section, to furnish without delay a return accounting for the excess referred to. I had some days previously heard that there was a material difference in the quantities, but

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this is the first occasion on which the matter has regularly come before me. I deem it proper, therefore, to lose no time in enquiring into the matter. I have as yet had no reply from Mr. McLennan, but possibly some explanation will come from him before long. In the meantime it is advisable to issue no further certificates on this contract. I think that is the proper course to take in the matter, and if the information required cannot be had in any other way, it may become necessary to have a re-measurement of the entire work.

"Yours very truly,
"SANDFORD FLEMING."

That is the letter I had reference to.

22136. Do you understand that letter as giving directions only as to muskeg material, because I understand it was on this subject you supposed you had written the letter?—This letter gives directions to Mr. Smith who, up to that time, had been issuing certificates in the contractor's favour, to issue no more.

Muskeg question not understood when letter written, but convinced that something was wrong.

22137. I do not understand you to indicate in that letter that you have any objection to the method of measuring muskeg?—No; the question was not understood then. The fact that the amount paid the contractor had then over-run the original estimate by something near $300,000 was quite enough to satisfy me that there was something wrong.

22138. That might have occurred if the measurements had been on account of excessive work in rock or loose rock would it not?—Possibly. I did not know the cause then, but it was in connection with the muskeg question.

22139. How do you make out that it was in connection with the muskeg question—I mean the contents of your letter?—Because I discovered subsequently the excess was due to the mode of measuring muskeg.

22140. Then that letter was written before you discovered the difficulty about the muskeg?—It was written when the difficulty was discovered; the precise nature of the difficulty I did not then know.

22141. I understood you to say before, that, as soon as the difficulty in the measuring of muskeg came to your knowledge, you wrote a letter upon that subject giving directions on that subject?—I may have been slightly astray as to that, but the difficulties referred to in my examination, yesterday, were on the muskeg question.

As a fact the first difficulty discovered was the excess of actual over estimated quantities.

22142. Do you mean now that the first difficulty which you discovered was that the work as executed largely exceeded the cost of the work which was estimated?—Yes.

22143. And that, having written a letter upon that subject in the words which you have read, you discovered afterwards that this difficulty was due to the excessive quantities measured as muskeg?—Yes; quite so. There was a difficulty—a serious difficulty—and I determined to make full enquiry into the nature of the difficulty before the contractors should be paid any more.

After discovering that the excess in quantities was due to the mode of measuring muskeg sent out letters to the engineers.

22144. After you discovered that the difficulty arose from the mode of measuring the muskeg, did you give any special directions regarding that material?—I did.

22145. In what way did you give them?—I sent out letters of instructions to the several engineers in charge of sections where that material was being used.

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22146. At what time did you send them?—I have a letter in my hand, dated 3rd of June, 1879, addressed to Mr. Jennings. Similar letters were addressed to Mr. Caddy.

22147. Is that the same which is printed in your memorandum of 1880?—Yes.

22148. Does that refer particularly to the mode of measuring muskeg?—It does, if my recollection is right, and it was done after the nature of the difficulty referred to in the letter which I have just read, was found out.

Instructions to Jennings respecting muskegs.

22149. On page 15, in clause 6, I find that you disapproved of the use of this material for embankments: is there some other portion of the letter which speaks of the method of measuring it?—I will be happy to read you clause 6. I begin at that:

Condemns use of vegetable matter of spongy nature in embankment.

"6. It may further be mentioned, for the information of Mr. Jennings, that on some sections under construction, when muskegs prevail and the embankments have been formed from side borrowing-pits and ditches, serious difficulties have arisen. The material so borrowed is reported to be, in many cases, vegetable matter of a spongy nature, holding much water, and when dry and compressed by a superincumbent weight, to have little solidity; it is consequently unfit to be used in the formation of earth embankment. The undersigned accordingly disapproves of its use.

In some cases ditches of little value, and then logging and brushing should be used.

"7. There is always more or less difficulty in forming embankments across muskegs or marshes. In some cases where a proper outfall is available, so that ditches would have the effect of draining and consolidating the ground, it is advisable to form them parallel to the line of railway. But when the ditches, after being formed would simply remain full of stagnant water, their formation is of doubtful expediency, and under such circumstances ditches are of little value. Indeed, in some special localities they may be a positive injury, and in all such cases it is advisable not to form them, but rather resort to a judicious use of the logging and brushing provided for under the contract.

"This being done a thin covering of earth to form a foundation and bed for the ties may be added. Track may then be laid, and thus allow material to be brought from any convenient distance by train. But if this expedient be resorted to, it will be necessary to bed the track sufficiently even and solid to prevent the rails from being bent or injured in any way.

To see that in no case the price of earth and haul together exceeds that of ballast, which, prices being equal, is best.

"8. These several points are brought to the attention of Mr. Jennings, but he will himself determine the best course to be pursued when he has specially examined each locality, and become acquainted with the depth of the muskeg and all the circumstances. In arriving at a decision, Mr. Jennings will take into consideration the question of haul, for which a price is provided, and he will see that in no case the price of earth and haul together (when material is brought by train) shall exceed the price of ballast, as in such cases ballast would probably be the best and cheapest material with which to form the embankment.

This is the section which I wish to direct your special attention to:

Where muskeg permitted to be used sparingly, and in all cases only the solid contents of the spongy matter to be paid or.

"9. There may be some exceptional case where it may be impossible for the contractor to procure suitable material for the road-bed, and where it would be a very great advantage to them and expedite their operations, if they were permitted to use in part the spongy material found in muskegs. This shall only be allowed sparingly, and in all cases when used, the solid contents of the spongy matter only is to be paid for. A log platform (clause 12) must invariably be laid on the surface before any of the muskeg material is deposited, and arrangements must be made to measure the solid cubic contents in the embankment after the water has had time to drain out of it. On these conditions as to measurement and payment, and on these only, will the undersigned approve of the use in any form, of this peculiar material."

Then I go on to point out that Mr. Jennings should inform the contractors of my decision in the matter, and so forth.

22150. I understand you to suggest in these instructions that the use of this material would not be approved of by you generally, and that in special cases where it might seem to be unavoidable, on account of the extra expense to the contractor if he were obliged to furnish other material, you would permit it to be used upon the condition that that measurement, or that mode of measurement

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which you suggest, would be acquiesced in by the contractor?—In those cases, and in the way described, I would permit it to be used.

22151. But upon the condition that the contractor should be informed first of your decision?—No; there was no condition of that kind.

22152. I understand it is only upon these conditions you would permit it to be used; that, in other words, you withhold your permission unless those conditions are agreed to?—Yes; but the informing of the contractor was not one of the conditions, because it would come to the knowledge of the contractor sooner or later, and I was desirous that the contractor should know as soon as possible.

22153. But do you not see that you are telling the engineer that you will not permit the material to be excavated and used unless a certain mode of measurement shall afterwards be adopted?—Yes.

22154. Well, how can you attach a condition to the removal of it which takes place before the mode of measurement is established unless by the consent of the parties?—I do not comprehend the question.

Witness's instructions as to use of muskeg that this conditioned on the contractor being allowed only solid contents of embankment.

22155. I understand you to say this in effect: I withhold my consent to using that muskeg material in embankments unless it is to be measured by the solid contents after compression: is that, in short, the substance of your instructions upon that question?—Yes; I point out how the material is to be used, and it amounts to this: it is to be measured in embankment so as to arrive at the solid contents of the material, and I say "on these conditions and payment, and on these only, will the undersigned" (that is myself) "approve of the use in any form of this peculiar material."

22156. You are attaching to your permission a condition as to the excavation; well, of course, one would think that that would be a condition precedent—that until that condition was ascertained or consented to, or in some way acquiesced in, you would withhold your consent—that the excavation, in fact, should not take place until it was ascertained that that condition would be complied with?—I said so in so many words.

22157. Then that involves the proposition that the contractor should consent to that condition before the removal, and unless he did consent to it that the material should not be removed?—He would be stopped—it he took any other course means would be taken to stop him. The engineer had the power to prevent him taking any other course—I mean the resident engineer.

Unless contractor complied with his conditions he would have given no certificates.

22158. Then, if the contractor did not consent to that condition, or was not informed of it beforehand, and proceeded to excavate without agreeing to it, or without being informed of it, he would not be, according to your own theory, as I take it, subject to this deduction in the measurement?—It just amounts to this: the work would come to a stand, or if he went on with the work against the positive instructions of my assistant on the ground, he would not be paid for the amount he did; he would get no certificate for work done. Mr. Jennings and the other were directed to make no returns unless in this way, and I would have taken very good care to have put my name to no certificate unless the material was used in the way directed and measured in the way directed.

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22159. Did you give any certificates after those instructions to Mr. Jennings, in which this muskeg material was measured in any other than your way; you say you would have taken good care not to do so?—I do not know, as a matter of fact, whether I did or not. If I did I would take it for granted that Mr. Jennings had carried out my instructions until I satisfied myself that he did not.

Meanwhile went to England.

22160. Then, in other words, without enquiry, you would assume that your instructions had been carried out, and that the muskeg was really measured in the embankments?—Now, that it has come to my recollection, I was directed by the Minister that very year, very soon after I left this, not on my own pleasure, but on public business, to proceed with Sir John Macdonald, Sir Leonard Tilley and Sir Charles Tupper, to England, and I went with them to England, and I did not return until some time in August, or September, so that I was not at the head office for some months after these instructions were issued. When I returned, I required to find out what certificates I signed before I could answer the question. I have no doubt at all that I took care that no improper certificates were issued.

Thinks an Order-in-Council was passed defining the way muskeg should be used.

22161. Is there anything further on this subject of muskeg material and measurement, which you wish to give in evidence?—No; I simply promised yesterday to produce this letter that I have now produced. It now occurs to me that while I was last in England, an Order-in-Council was passed defining the way in which this muskeg was to be measured, and to what extent it was to be employed, and, I believe, this was conveyed to the gentlemen whose names I had already given, Messrs. Jennings and Caddy, and they have been acting under that Order-in-Council since then, I suppose.

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Found it impracticable to cause exploratory to precede instrumental surveys, and that being so the cost of it was not considered.

22162. When we parted, yesterday, we were considering the comparative cost of exploratory and of instrumental surveys, particularly with reference to the eastern section which was the one upon which you were giving evidence: can you now give us further information upon this question of the comparative cost as to any given length of country?—Well, I am afraid I cannot give you very satisfactory information. I found it impracticable to begin and carry on the survey in that way, and it being impracticable, the cost of it was not considered. It was impracticable for more reasons than one. The men that could make a survey of that description were not available: they were not to be had in the country. Any men that I did know myself that could do it were then engaged.

Could not get the men fit for such work.

22163. Engaged on instrumental surveys?—Engaged on other work—on other lines of railway, or other work. Their services could not be had, and I had to devise some other means of getting the required information, so that the question of the cost of doing it in the way that you suggest was not considered.

22164. You say that men fit for this exploratory examination of the country were scarce, and were not to be had in sufficient numbers to enable you to depend upon that system or method at first: is that what I understand?—Yes.

22165. Then I suppose you also imply that if you had sufficient men at your command you would have followed that course of exploration?—If I had been able to spare the time, and if I had been ubiquitous, I would have done it myself; but I could not do that. I could not have

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spared the time. It would have taken a very long time for one individual, and I knew of no other men that were then unemployed who could do it.

22166. But I understand you to imply that if the right men could have been found you would have adopted this system?—I would have employed it to some extent, not to the whole extent. There are some portions of the country where I think I would have adopted the same course that was adopted.

If the right men could have been found would have employed exploration to some extent.

22167. Which portions do you now allude to?—I refer more particularly to the section—the broad blank on the map that then was—lying between the River Ottawa and Lake Nipissing, and the northern bend of Lake Superior, a long distance, some 600 miles.

22168. Now, I understand that you mean that even if you had it in your power to be ubiquitous, and to have made these surveys by exploration yourself, you would still have decided upon an instrumental survey, as was at that time adopted?—For a very considerable portion of the country.

The country lying between the River Ottawa and Lake Nipissing, and to the northern bend of Lake Superior, he would under all circumstances have had examined by an instrumental survey.

22169. Is this the only section you referred to?—Yes.

22170. Between the River Ottawa and Lake Nipissing to the northern bend of Lake Superior?—Yes.

22171. So that irrespective of any surrounding circumstances, you say that the system adopted was the one which ought to have been adopted at that time?—To a large extent in that section.

22172. In adopting the instrumental method, do you get the information of as broad a strip of the country as you do by explorations?—You get the information of a kind that you require more than the other. To get the information by explorations, which are commonly called track surveys, the explorer would, as a rule, follow the water channels, the rivers and streams. These are all the depressions—the natural depressions of the country, and he would be unable to gain much knowledge concerning the land between those streams. By adopting the course I did I went to the core of the difficulty and got information in the general direction which it was desirable that the line should follow.

22173. In adopting the instrumental surveys, do you get information upon as broad a strip or area of the country as you do by exploratory examinations, or track surveys, as you have described them?—You get quite as broad, if not broader, because the instrumental survey embraces those track surveys and side explorations. If you allow me to draw your attention to the map of the country—take any one section—take the section in the neighbourhood of one of those Hudson Bay canoe routes—say the route from Michipicoton to James Bay: a track survey on that river would give you very little information that would be useful in projecting a railway. It would give you information of the country between Lake Superior and James Bay or intermediate points, but it would give no information of the country lying ten acres distant to the right and left of that: unless you could find a river or navigable stream that was lying in the general direction you wanted to go you would get very little information indeed. That canoe route that I have just referred to crosses, and could only cross, the line of the railway at one point, and it was impos-

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sible to say where that point would be at the first off-go—quite impossible.

22174. I do not think my question was sufficient to draw from you the information which I intended to ask for : I think I should have qualified it?—You spoke with regard to breadth of country. It would certainly give you, in the instance I refer to, greater knowledge of the breadth of the country; but it was knowledge of the length of the country we wanted more than the breadth.

22175. I will come to what I want afterwards. I am trying to work out the subject so that I can comprehend it myself: I know that you are very familiar with it. Would the same time and the same amount of money enable the Government to obtain the information over as wide, as broad an area of country by instrumental surveys as by exploratory surveys?—I think the plan adopted, which embraced instrumental surveys as well as explorations gives the desired information quicker and at less cost than it would have been possible to have done it with simpler explorations.

Witness says exploratory survey would never have given the information needed even if they could have been made.

22176. Do you mean with simpler operations at the beginning, and then followed by instrumental surveys, or do you mean that a simpler exploration would never have given you the accurate information that the instrumental survey did?—Well, I mean both. The explorations would never give us the information that we wanted if they could have been made—if we had the men to make them. They would have given us a certain amount of information, but it would not have been satisfactory, unless a great deal of time had been spent over it, years and years, and unless the very best description of men we had for that service had been employed.

Knowledge requisite before the location of the line, could have been acquired **better by a simple exploration**, excepting one of the eastern sections.

22177. For the present let us put out of the question the matter of available men for the service, and assume that any amount of available men could have been obtained; then the question I ask is this: whether some information towards the knowledge requisite before the location of the line could have been acquired over a wider area (I do not mean length so much as breadth of the country), by what is called a simple exploration better than by an instrumental survey for the expenditure of any given time and money?—In that case it could in certain sections of the country, but in one of the sections, particularly between Lake Superior and Ottawa, I still would have had the instrumental surveys made.

22178. Then you mean that in the district or in localities other than the one you name, an exploration would have given information of some kind over a wider area than instrumental surveys; but notwithstanding that you consider the circumstances in this case exceptional, and that the instrumental surveys were proper to be adopted?—Had there been plenty of time, and had there been a sufficient number of available men, it would have been advantageous to have employed them in making explorations with the barometer and micrometer and the ordinary track surveys, over a wide extent of country between Red River and Lake Nipigon. and perhaps a little distance to the east of Lake Nipigon; but I still think that, even under these circumstances, it would have been advisable to have made an instrumental examination in the way it was done between the Ottawa and the northern bend of Lake Superior.

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22179. What is the reason which would take that particular strip of country out of the ordinary rule: why is it that you think that ought to be commenced by instrumental surveys rather than this other section which you say might better have been first explored?—There are several reasons. These track surveys would generally be done by canoe on the water channels, and there are no water channels running in the proper direction, or they are very few indeed in the section of country to which reference is made. If you examine the map—the last map, with all the water channels laid down on it—you will find that they run generally north and south instead of east and west.

Reason why he excepts country between Lake Superior and the Ottawa.

22180. And do you mean that the country cannot be examined by a bare exploration except through the water channels or some other depressions?—Not very easily.

22181. But with some difficulty?—With very great difficulty. I have done it myself, but it is not an easy matter.

22182. Do you mean that it entails great hardship on the persons employed?—Great hardship, and the results are not very satisfactory.

22183. Although made with the micrometer and barometer?—Oh, you cannot use a micrometer in the woods. It must be an open country to use a micrometer.

Cannot use a micrometer in the woods.

22184. Were these bare explorations which you recommended to be made in the winter made through the woods?—These examinations were made with facility in the winter on account of the freezing of the rivers and lakes.

22185. But the rivers and lakes, I understand it, ran in a different direction from the line you were exploring?—The explorations were not made in the section of country I speak of. They were made in another section of country. They were made to the east and west of Lake Nipigon, not between Lake Superior and the Ottawa River.

The explorations which were made, were made to the east and west of Lake Nipigon.

22186. As to the difficulty of getting men fit for this service of exploration, what are the requisite qualifications of a person for that service?—Well, I should consider a properly qualified man would be one who is qualified to take the position of a chief engineer.

No man fit to do the work of an explorer who would not be fit to be chief engineer.

22187. You think that would be requisite, do you?—I think so.

22188. Did you direct Mr. Horetzky to make some explorations in the western part of the country?—Oh, that is another matter altogether.

22189. I understood that you selected him for that work: is that correct?—Mr. Horetzky went out as a photographer to begin with.

22190. Was he not employed as an explorer to explore the practicability of certain portions of the country—the neighbourhood of Peace River or the Pine River Pass?—I am afraid that will branch off into another subject which will take a long time to discuss. If you are anxious to discuss it I am ready.

22191. I understand you to say, for the purpose of this exploration, the men fitted for it were few, because no man was fit for it unless he was fit for a Chief Engineer. That is, as I understand it, the substance of your evidence on that point. Now I ask you whether you have not employed men to do this service who were not fit to be chief engineers?—I have frequently been obliged to employ men to do work who were

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not the men best fitted for it, frequently because I could get no other.

22192. But still you considered it advisable to get them to do this work?—Sometimes it is necessary to employ men, because—for other reasons altogether.

22193. Do you consider all the men, or any of them whom you employed to take charge and manage simple explorations, to be up to the standard which you have made?—In these explorations?

22194. Yes?—Well, there were none employed in the way you speak of, solely making explorations. They were making simple explorations as a rule.

Over some portions of the country there were simple exploration parties at work.

22195. I understood you to say that over some portions of this country, at some seasons of the year, persons were doing nothing but exploring—that several parties were engaged simply as exploring parties: is that right?—That is right.

All the men in charge of these parties not fit to be chief engineers.

22196. Were they all under the charge of men who were fit to be chief engineers?—They were not.

22197. Well, then, you found it expedient to employ men for explorations who were not up to the standard?—But the character of the explorations was quite different. These other explorations that you refer to were in connection with the instrumental surveys. We had the instrumental surveys as a base to refer the explorations to.

But these explorations were branch lines from an instrumental base.

22198. They were branch examinations?—Branch examinations.

22199. From a base line ascertained by instrumental survey?—For the most part they were branch examinations.

22200. Do you know whether persons who are not in the profession are sometimes employed as explorers, to ascertain first the feasibility of a country before employing professional men afterwards to survey it instrumentally?—Oh, yes; lumbermen, Indians and others, are sometimes asked to give their opinion about certain portions of the country they have been through, but it is not always to be implicitly relied on. They may give it honestly enough, but they are very apt to be, and very often are, grossly mistaken.

Does not remember a case where a non-professional man has ascertained the feasibility of a country for a railway.

22201. Does it not sometimes happen that the feasibility of a country for a railway is ascertained by persons not in the profession at all, and is afterwards acted on?—I do not know that it is. I do not at this moment remember any case.

22202. In a country where you can use the micrometer and barometer, any person who understood the use of them would be able to get some information towards establishing the feasibility of a railway through it?—Not necessarily.

Explains the difficulty of getting a man capable of making a simple exploration.

22203. What would be the difficulty?—Any one could, in a very short time, learn the use of a barometer. Any one, in a very short time, could learn the use of a micrometer. It does not follow at all that they would be able to give you any valuable information with regard to the country, because they could use the instruments.

22204. If they could use them and did use them over any particular portion of the country, would not that give valuable data in exercising a judgment on the feasibility of the railway?—It would be available as far as it went, but that would be all.

Surveys—Character of Survey.

22205. To what length would it go: would it give the distances and the heights of the surface of the country?—A single observation by means of the micrometer, if accurately executed, would give you the distance between two points. A number of observations, unless they were systematically arranged, might give you very little information. It would have to be done according to certain rules—certain well understood rules.

22206. Would these rules be difficult to understand by persons of ordinary intelligence?—There is nothing difficult about it, but it would take some little time to acquire sufficient experience. I do not think you could take any intelligent man and make him fitted to make these explorations at very short notice. These explorations that you refer to are the sort of explorations that are made very largely by the Geological Survey—by Mr. Selwyn, by Prof. Bell, by Dr. Dawson and one or two others. These are not only men of very great intelligence, but of considerable experience.

Most direct line a long way back from the lake.

22207. In ascertaining the nature of the country and the feasibility of a railway—between Nipissing and Nipigon, for instance—was it necessary to go far from the frontier?—That is exactly what I wanted to find out by the examination. I wanted to find out how close to a direct line we could get a railway, and the most direct line was a long way back of the lake.

22208. Could you ascertain that, as regards the depth of the country between the frontier and the line, better by an instrumental survey running principally easterly and westerly than by explorations running principally northerly and southerly?—Much better, much cheaper and much quicker.

22209. To what depth do you think you obtained information of the nature of the country by the instrumental survey adopted?—I could hardly say. To a considerable depth, some places fifty miles—a breadth of fifty miles.

Considerable breadth of country examined.

22210. On an average what would the depth be?—I can hardly say. It depends upon information that I have not at my finger ends now, but, taken with the explorations, a considerable breadth of country was examined. These examinations took place perhaps 120 miles away back of the Georgian Bay, and a lesser distance back of Lake Superior —150 miles back of Georgian Bay.

Course followed in making instrumental survey: parties proceeded to some point inland and investigated east and west.

22211. I understand the course which was followed in making this instrumental survey was, that the parties would proceed to some point inland, a considerable distance from the frontier, and then pursue their investigation easterly and westerly: is that the nature of the work?—Yes.

22212. So that, in effect, you obtained instrumental information upon a line a long way inland and far from the frontier, but running easterly and westerly in the general line of the railway?—Running in the desired direction. One party would proceed up the Michipicoton River, and I should say to you the number of points where the interior of the country was accessible were extremely limited. The Michipicoton River was one of them, and we sent more than one of our parties up the Michipicoton River, with instructions to examine to the right and left, and penetrate the forest towards the Ottawa in a certain

Surveys—Character of Survey.

general given direction, so that they might come out or meet another party from the Ottawa midway.

22213. In devising the method of surveys, at the beginning of this undertaking in 1871, I understand you to say that it was a matter of great urgency in your opinion, and according to the information you received; did that induce you to adopt the operations without any great consideration as to the comparative cost of different kinds of expeditions?—I think I may say yes to that question. First of all, I considered what sort of examination was needed—what sort of examination was practicable under all the circumstances. Then I went to work to carry out that examination, not regardless of cost, but with the primary object in view of getting the most satisfactory results with the least possible delay.

May have compared the cost of different methods but cannot say to what extent, as he considered the cost a secondary consideration.

22214. Did the cost of the different expeditions or methods of operation enter into your consideration so far as to make you compare the relative cost of different kinds of expeditions?—I may have compared them in my own mind, and no doubt I did think over it very seriously, but I cannot positively say to what extent, nor can I produce any calculations as to the cost of the different methods.

22215. Did you consider that the cost of the operations was a matter of secondary consideration?—I did.

22216. And that the main object was to ascertain, as early as possible, the information which would enable you to locate a line?—The main object was to get the information desired by the Government.

22217. Which was to locate a line, as I understand you?—Which was, first, to ascertain if a line was practicable; second, where it should go, and in due time to locate the line.

22218. The final object was to locate the line?—In the fewest possible words to establish a line of railway from the one side of the country to the other.

Finds from a paper before him dated 16th April, 1877, that between the Ottawa and Red River exploratory surveys were made over nearly 10,000 miles.

22219. Is there anything further connected with this eastern or wooded section, and connected with the surveys, which you wish to add to your evidence?—I do not know that there is. I see by a paper before me, that has been prepared evidently with some care, dated 16th April, 1877—prepared for the purpose, I think, of informing either the Senate or House of Commons—that although instrumental surveys were made through that country, between the valley of the Ottawa and Red River, to a considerable extent, exploratory or track surveys were by no means neglected. I find that a total mileage of very nearly 10,000 miles of track surveys were made between the valley of the Ottawa and Red River from first to last.

BURPE.

T. R. BURPE's examination continued:

Purchase of Rails—Contracts Nos. 6-11.

By the Chairman:—

22220. I think you said that you had charge of the correspondence between Mr. Fleming and other parties during the time that he was Engineer-in-Chief, or after you became connected with the Department?—Yes, I had.

Purchase of Rails—Contracts Nos. 6-11.

22221. Have you searched for any letters or copies of letters from Mr Fleming to Mr. Sandberg on the subject of the rails purchase?—Yes; I have searched through the books. The first letter I find is in November, 1874, after the purchase of the steel rails.

The first letter from Sandberg to be found is after the date of purchase of steel rails.

22222. That is after the tenders had been received?—After the contract was let.

22223. You find none before that from Mr Fleming to Mr. Sandberg?—None before. All our correspondence up to the 1st of January, 1874, was destroyed by fire.

SANDFORD FLEMING's examination continued: FLEMING.

By the Chairman:—

22224. You have heard the question which was asked Mr. Burpe on the subject of the correspondence from you to Mr. Sandberg: could you say whether there was any such correspondence?—I am as certain as I am of anything that there was correspondence.

22225. From you to him?—From Mr. Sandberg to me.

22226. I am asking whether there was any letter from you to him?—I received several letters from Mr. Sandberg—more letters than I think I answered. I probably acknowledged the receipt of two or three at one time, having a great deal else to attend to, and not much more than the acknowledgment. Indeed, I would occasionally let them accumulate, but I have a distinct recollection of receiving the letters referred to, and I am as clear on that point as I am of anything.

Received several letters from Sandberg.

22227. It is not with respect to any doubt of that I am asking the question: the letters from you to Mr. Sandberg, as I understand you to intimate, would be in answer to some from him to you, not asking him to write to you?—I think the information was voluntary on his part: I did not ask him at all.

Sandberg's information volunteered.

22228. He voluntarily made the suggestion to you?—He volunteered the information. As to the non-appearance of the letters, I stated yesterday that possibly I handed the letters to Mr. Mackenzie.

22229. That is, the letters from him to you?—Yes. There would be no record of them in the head office. I probably would be away all summer and they might have been received by me in my absence from Ottawa.

22230. Will you please explain the system of surveys in British Columbia, if there is any distinction between the course adopted there and that of the eastern section, or if there is any other explanation that you think proper to give in connection with it?—I will have to refer to the instructions and telegrams and various documents bearing on that branch of the subject, and I may be a little tedious. However, I will endeavour to be as short as possible. With regard to the mode of proceeding with the work of the survey in British Columbia, which began about ten years ago, I confess that at the time I was very greatly puzzled. I had never been in that country, and the country is one in respect of which it is very difficult to form a proper idea with regard to its character, even after reading the very best description of it. Our

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operations had to be conducted in remote parts of the province which had not been visited by people—by travellers—who left a record behind them, because I endeavoured to get all the information, I could from every source. I gathered much valuable information particularly with regard to the country east of the Rocky Mountains, and in the Rocky Mountains, from the reports of Capt. Palliser, especially respecting some of the southern passes through these mountains; from the journals of Dr. Ray, Milton and Cheadle, and others, I learned about the Yellow Head Pass and other sections of the country. I had the benefit of a personal interview with the Hon. Mr. Trutch, subsequently Lieutenant-Governor of British Columbia, and who, although he himself had never been in the mountains, knew a great deal about British Columbia, perhaps as much as any other man. I thus endeavoured to gather generally from every source all the information that I could, and I learned that at two points, namely Howse Pass and Yellow Head Pass, the most promising entrances into British Columbia through the Rocky Mountains from the east was offered through one or other of those passes. I had no conception then that obstacles barred the direct way to the Pacific Ocean to the west of the Rocky Mountains, even more formidable and vastly more difficult to overcome than the Rocky Mountains themselves afterwards proved. I was at a great loss to find engineers whom I considered qualified to make the necessary examination. There were a number of gentlemen in British Columbia whom it was deemed advisable, for reasons that will be understood, to employ.

Gathered information from writings of Capt. Palliser, Dr. Ray, Milton and Cheadle. Conversed with Trutch, learned that **Howse Pass and Yellow Head Pass** furnished the most promising entrances into British Columbia

22231. You mean for their engineering abilities, I suppose?—No; for political reasons. These gentlemen were unknown to me. I never even heard their names before, and I personally knew nothing of their qualifications. I heard of one gentleman, however, whom I had known many years ago, and I was informed that he had spent much of his subsequent life in British Columbia in making explorations and in forming trails and making roads, that he was familiar with the mountainous districts, and particularly those adjoining the Columbia River to the west of Howse Pass, and that he was well qualified to carry out with expedition and success any examination required in that quarter. I obtained the authority of the Minister to engage that gentleman, Mr. Moberly, and I placed in his hands the duty of finding out all the particulars respecting Howse Pass as a route for the railway. I likewise succeeded in securing the services of Mr. Roderick McLennan, who, I believe, was well qualified to make an examination in a rough country. I knew him to be a man of energy and ability, and of considerable experience. I placed the examination of Yellow Head Pass and its approaches in Mr. McLennan's hands. Another gentleman, Mr. John Trutch, residing in British Columbia, a brother of the late Lieutenant-Governor, was likewise appointed, and placed in charge of a district extending from the Lower Fraser to Kamloops and Shuswap Lake. These three gentlemen were appointed district engineers, and were placed on an equal footing as such. Mr. George Watt, a gentleman whom I had not previously known, was appointed to lead the commissariat department, to control and account for the expenditure. It was the wish of the Government that these three district engineers should fill up their surveying staff, as far as possible, from residents of British Columbia. As a matter of fact, only four other engineering gentlemen were sent from this side, and one of them really belonged to British Columbia. Their names were Messrs Mahood, Rhéaume, Ireland and Dickey. These four were

Several gentlemen in British Columbia whom he employed on other than engineering grounds.

Obtained authority to employ Moberly and directed him to find out all about **Howse Pass.**

Placed the examination of **Yellow Head Pass** in McLennan's hands.

John Trutch was in charge of district from **Lower Fraser to Kamloops and Shuswap Lake.**

Four others sent from Ottawa: **Mahood, Rhéaume, Ireland and Dickey.**

appointed under the authority of Sir George Cartier. The first mentioned, Mr. Mahood, had previously been connected with explorations in British Columbia. He was a stranger to me. In connection with the commissariat branch of the survey, another gentleman, Mr. Sherwood Hall, was appointed. He also was a stranger to me. Mr. Moberly was selected to make an examination of the country lying between the Kootanie Plain, east of Howse Pass, and Shuswap Lake, to the east of Kamloops. I should mention here that he had previously informed me that he was familiar with the country easterly from Shuswap Lake, and had, in fact, discovered a favourable route for a railway through what is known as the Gold range, which lies between Shuswap Lake and the Columbia River. The point which I myself had most doubt about was at and near Howse Pass, although it was considered desirable to confirm the statement made by Mr. Moberly with respect to the Eagle Pass.

22232. That is the pass which you thought he had discovered?—Yes; the path through the Gold range. I directed him accordingly to proceed with all possible despatch to Howse Pass and test the matter by actual survey. I further directed him, in order to save time, to detail a portion of his staff to begin an instrumental examination between Shuswap Lake and the Columbia River.

22233. Through the Eagle Pass?—Through the Eagle Pass; and I requested him to make every possible exertion to form a junction between Howse Pass and Shuswap Lake ~~between~~ before the close of the season. Mr. McLennan was similarly directed to cross the mountains from the west by the Yellow Head Pass, and make an instrumental examination of the pass and its approaches on either side, so that we would secure the data to make a proper comparison between Howse and Yellow Head Pass as soon as it was possible to do it.

Directions to Moberly, McLennan and Trutch.

22234. Could you say from what point each of these engineers was to begin his instrumental examination?—Yes. Mr. Moberly was to begin his instrumental examination at Kootanie Plain. Mr. McLennan was to begin, if I remember his instructions distinctly, this side of Yellow Head Pass, after having passed through it and explored it. Mr. John Trutch was directed to examine the district lying between Shuswap Lake, and the Lower Fraser, a section which is to a large extent common to the two routes across the Rocky Mountains, the one by Howse Pass, and the other by Yellow Head Pass. These three gentlemen were left entirely to their own discretion, with respect to the strength of their parties, the arrangement of their staff, and almost everything else. My instructions were very general. It is quite a mistake to suppose, as may be inferred from some of the evidence I see by this Commission, that they were debarred from making any but instrumental surveys. They were enjoined, in the first place, to make a general examination in advance, and I would like to read you a portion of the instructions which fortunately I have with me. The instructions to Mr. Trutch and others were similar:

"You will commence the survey in this district by making a general examination of the country, in order to ascertain where it would be most advisable to make the survey."

Both Mr. Moberly and Mr. McLennan were expected to gain a general and full knowledge of their whole districts, before any instrumental work was attempted; and in view of this they were instructed to begin with the instrumental work at the remote end.

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22235. The eastern end?—Yes; the remote eastern end, in order that they would have an opportunity of becoming familiar, in the first place, with the features of the country over which the route was projected.

Instructions general. Left nearly all to their own discretion.

22236. They would then be going over the ground a second time by their instrumental examination?—By their instrumental examination. My instructions to these gentlemen, both verbal and written, were general. I purposely left nearly all to their own discretion, merely pointing out the locality of the respective surveys, and the character of the information desired. I felt it would be a mistake to tie them in any way by rigid instructions, and that it was much better to leave to their own good sense all matters of detail, and allow them, in their own way, to bring the examination to a successful issue with the least possible delay; and if proof of that is needed, I would like to read the instructions to the three gentlemen, or a portion of them. It may not take many minutes to read one or two paragraphs.

Letter of 14th June, 1871, to McLennan.

22237. Read?—It is addressed to Mr. McLennan, 14th June, 1871:

"SIR,—The Government having determined to commence an exploratory survey for a line of railway through Canada to the Pacific coast, have appointed you upon my recommendation to take charge of the surveys and explorations to the district line to the west of Jasper House, latitude 53 degrees, 12 minutes and 15 seconds. You will commence the survey of this district by means of one or more parties to be placed under your directions, one of these to commence work at Jasper House, said to be 3,372 feet above the sea, and endeavour to find the most practicable line for a railway from that point in a southerly direction towards Henry House, and thence through the Yellow Head or Leather Pass in a westerly direction to Tête Jaune Cache. You will also have a general examination made of the country lying between Tête Jaune Cache and the eastern end of Quesnelle Lake, or the northern end of Clearwater Lake, with a view of ascertaining whether it would be advisable to attempt a location of the line through that country. This exploration ought also to enable you to form an opinion as to whether there is a likelihood of its being possible to find a practicable line southwards from the Leather Pass to the waters of either the Thompson or Columbia Rivers. On the examination demonstrating the practicability of all these routes, you will then direct the exploration to the westward with a view of finding the most direct practicable route for a railway from Tête Jaune Cache to Quesnelle mouth.——"

22238. That would be crossing the Cariboo range?—Yes.

"Should you not succeed in finding such a line through the mountains about Cariboo, you will have to endeavour to find a location by following the waters of the Fraser River generally from Tête Jaune Cache."

I refer to the general instructions, and I mention that—

"George Watt has been appointed commissariat officer for the survey in British Columbia, with whom you will therefore confer and arrange for procuring and forwarding supplies, and financial arrangements generally."

Howse Pass.

Instructions to Moberly.

I need not read any more, though I should be happy to read the whole of it. Now I will read a few paragraphs from the instructions to Mr. Walter Moberly. After pointing out the general direction of the survey from Kootanie Plain to Shuswap Lake, I go on as follows:—

"As the season favourable for exploration in that section will be considerably advanced by the time you arrive there, it would be perhaps desirable that you commence work at the Kootanie Plain end of your district"——

22239. The Kootanie Plain is east of Howse Pass?—It is east of Howse Pass—

"In order that you may be working towards the base of supplies as the season advances, but on this point you must, to some extent, be guided by circumstances and the experience you have already gained in that country In the event of your commencing operations at the Kootanie Plain, you will be careful to select a starting

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point where the country presents as favourable a prospect as possible for the location of the railway, and where such references takes, bench marks, &c., as you establish, will be most easily found by any exploring party going from the east, who may be in search of them."——

I should state, by way of parenthesis, I had taken means to have the exploration from Fort Garry to the Mountains, or one of them, terminate at Kootanie Plain—

"Should it be found, however, more desirable to begin at some other point in the district, you will, upon arriving at the Kootanie Plains, first, carefully examine and see if any such marks have been established by a party from the east. If so you will close your work on them, and, if not, you will act as directed in the general instructions. Taking for granted that you began at the place first indicated, it would be your duty to try and find a practicable route for the railway through Howse Pass to the valley of the Columbia River, in as direct a line as practicable to the western end of your district. Should you fail to find a passage through the Selkirk range of mountains, you will follow the valley of the Columbia River until you can cross the Gold range of mountains through the Eagle Pass discovered by yourself on a former occasion. You will begin the survey of this district by means of two fully appointed surveying parties to be placed under your direction, one of these to begin, as already indicated, on the eastern side of the Howse Pass, the other to begin at Shuswap Lake and to work easterly through the Eagle Pass. You will make every possible exertion to form a junction between the two parties before the close of the season."

To begin survey by two fully equipped survey parties to explore Howse Pass and Eagle Pass.

22240. When you speak of two fully equipped surveying parties, do you mean for instrumental survey?—For instrumental work; yes. I wanted to have definite information about these passes. They were explored before. They were explored before by Palliser's expedition. When I said they were explored, the Howse Pass was explored before; the Eagle Pass was explored by Mr. Moberly himself.

22241. Through these particular passes the feasibility of the railway, as you considered, had been established, and you prepared these two parties for making a closer and more accurate examination, in order to get profiles if necessary?—So as to make a comparison between the two passes, the two leading entrances into British Columbia, the Yellow Head and Howse.

22242. Then the country within the bend of the Columbia River was the principal portion not yet examined?—It was the principal portion that had not been yet examined, but I knew perfectly well a practicable line of railway could be found along the bank of the river. I instructed them to try and find a passage across the Selkirk range, and in the event of not finding such a passage it would be necessary to follow the Columbia River. I must trouble you with some more reading, because I wish to explain to you that everything was done that I could do to secure satisfactory results. I sent a number of letters to George Watt, the commissariat officer, pointing out what his duties were, and directing him to control the expenditure as much as he possibly could. I also sent a letter to His Excellency the Hon. Anthony Musgrave, Governor of British Columbia, which I see here, and which I have not read probably since it was written. It is not very long. It is dated 24th June, and is as follows:—

Instructed them to try and find a passage across the Selkirk range.

Sent to Watt directing him to control expenditure as much as possible.

"SIR,—The Government of Canada having appointed me Engineer-in-Chief of the Canadian Pacific Railway, with instructions to proceed with an exploratory survey with as little delay as possible, over the whole country between this place and the Pacific Ocean, I ventured to telegraph you some time ago for the names of those engineers and surveyors in British Columbia who would be available for the survey, it being considered desirable to employ as many as possible of those who reside in that colony. I received your reply, reported the names to the Government and received authority to employ the gentlemen whom you mention. For the present, the survey in British Columbia will be divided into three districts, under three district engineers. I have selected to fill these offices: Messrs. John Trutch, R McLennan

Letter to Governor of British Columbia.

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and Walter Moberly, and I have requested that these gentlemen submit to you their instructions so that you may be fully informed with regard to all proposed operations. Other gentlemen in British Columbia will be employed under the district engineers. I hope, myself, to visit British Columbia about the middle of August.

"I have the honour to be, &c."

The work went on, I had no means of communicating with the parties examining the routes to the Yellow Head and Howse Passes after they left. So soon as definite information was received, the merits of the two routes were carefully weighed. The result of the comparison we were enabled to make is given in my report of April, 1872, and I would just refer to one or two paragraphs :

Comparison of Yellow Head and Howse Passes. (Report of 1872, p. 10.)

"With regard to the survey between the Rocky Mountains and the Pacific coast, although a great deal still remains to be done, material progress has, undoubtedly, been made.

"A very favourable line for a railway has been found through the Gold range by the Eagle Pass, extending from Little Dalles, on the Columbia River, to Great Shuswap Lake, and an instrumental survey has been completed from the foot of the last named lake to Hope, on the Lower Fraser River. The general engineering features of the approaches to Howse Pass have also been ascertained

"The surveying expedition which left Victoria on the 20th July to find a moderately direct line from Quesnelle Mouth, through the Cariboo country to Tête Jaune Cache, has failed in its object. The lowest pass discovered through the Selkirk range, although about 1,000 feet lower than the mountains adjoining, is reported to be at such an elevation that the ground falls on one side 1,600 feet in five miles, and on the other 2,300 feet in about six miles, thus proving the pass impracticable for a railway, unless with a tunnel at an enormous cost."

22243. Now, before we leave that point, I understand that to be the route travelled by Mr. Moberly on his way to Howse Pass with one of those surveying parties?—I am not sure that he personally travelled it. I do not think it is on the line of travel.

22244. Do you understand that this information which you are now describing in that report was obtained by Mr. Moberly's party?—Yes.

22245. At that time?—Yes.

22246. One of those surveying parties that he took with him?—One of the exploring parties.

22247. Then, before we leave that, do I understand that that particular feature of your report is based upon information obtained by a bare exploring party?—With regard to the Selkirk range?

A possible line across Selkirk range found.

22248. The feasibility of a line across the Selkirk range?—Yes.

22249. Was it established by an exploring party?—Yes. I continue to read :

"A favourable pass from the North Fraser River, in the neighbourhood of Tête Jaune Cache to the north branch of the Thompson River, has been found.

"According to the information received, this will admit of a line being constructed from Yellow Head Pass to Kamloops, with grades not exceeding fifty feet per mile.

Favourable grades between Kamloops and the summit of the Rocky Mountains *via* North Thompson and Yellow Head Pass led to abandonment of Howse Pass. (Report of 1872, pp. 10 and 11.)

"The fortunate discovery of a practicable line with grades so favourable, between Kamloops and the summit of the Rocky Mountains, via the North Thompson and Yellow Head Pass together with information received from the expedition, which examined the country on the eastern slope of the mountains, led to the abandonment of all further work on the survey via Howse Pass.

"Kamloops is an important point on the line which was being surveyed from New Westminster through the Eagle Pass to Howse Pass. The distance from Kamloops to a common point near Edmonton House, is not greater by the North Thompson and Yellow Head Pass, than it is by Eagle and Howse Pass, while all information goes to show that a very much better and less costly line can be had by the former than by the latter route.

"This led to the adoption by the Government on the 2nd inst., of the Yellow Head Pass as the gate to British Columbia from the east.

"The next important consideration is the establishment of the railway route from Tête Jaune Cache to the Pacific coast."

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I read this paragraph in order to show that at least one important step had been made by the operations of the survey up to that time, and that the survey itself was simplified and the expense reduced.

22250. Upon that question I should like to get some further answers from you, before we proceed to any other branch of the subject: I gather from what you have read and said, that the object of this first season's operations was to ascertain the comparative merits or feasibility of two lines from a common point about Kamloops, one going through the Howse Pass and the other through the Yellow Head Pass?—Yes, to a large extent.

While Howse Pass commanded only Burrard Inlet, Yellow Head commanded every terminus on the coast known at the time.

22251. In what respect is it not correct?—In this respect: we had another object in view. We had the question of reaching the Pacific coast at points other than Burrard Inlet. According to the map, it will be seen that while Howse Pass commands Burrard Inlet and only Burrard Inlet, Yellow Head Pass itself commands not only Burrard Inlet but every other point on the coast that was then projected as a terminus.

22252. If some point on the Pacific coast, to the north of Burrard Inlet, had been the terminus, there would be less necessity for surveying the line that Mr. Moberly took than if Burrard Inlet should be the selected terminus, would it not?—Had it been determined to go to any of the points north of Burrard Inlet, with the exception of Howe Sound, there would be no necessity of making an examination of Howse Pass.

22253. Then the most favourable view to take of the necessity of the Moberly operations would depend on the Burrard Inlet as a terminus?—Entirely.

22254. Then, taking that view of it so as to give his operations the benefit of the greatest argument in their favour, I understand from what you have said and read that the object of this expedition by Mr. Moberly was to ascertain whether the Howse Pass, which was known to be a feasible one, and the Eagle Pass which was considered to be a feasible one, could be utilized by making a line as directly as possible between them?—Yes; that was the object.

22255. That is the main object?—Yes.

22256. That was ascertained, I understand, by a bare exploring party?—The feasibility was ascertained.

22257. By a bare exploring party?—Well, the probability of the line was ascertained. We had no knowledge, or no sufficient knowledge, of the approach to Howse Pass from the western side.

Object of Moberly's expedition.

22258. In your report you have said, in April, 1872, that it was ascertained that that particular pass through the Selkirk range was an impracticable one for a railway unless by a tunnel at an enormous cost?—That is another thing altogether.

22259. Is that right?—Yes.

22260. That fact, which I understand was the turning point in the usefulness of that particular expedition——No; pardon me for interrupting you.

22261. That particular fact which I understand to be the turning point in the usefulness of that expedition was ascertained by a simple exploring party?—That was not the turning point; that was simply

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one of the features of the route. We wanted to discover whether or not a more direct line between Howse Pass and Eagle Pass than going round by the Columbia River and Boat Encampment.

22262. Exactly: that is as I understand the object of the expedition?—But that is not the turning point. The turning point, as I understand, was at Howse Pass itself—the principal turning point.

Instrumental examination of Howse Pass combined with the knowledge of the difficulty of getting through the Selkirk range led to the adoption of Yellow Head.

22263. Did you not decide, or did not the Government decide, upon the merit of the route to be adopted, and which was to be through the Yellow Head Pass, without a close examination of Howse Pass?—No; we had a measurement of Howse Pass—we had an instrumental examination of Howse Pass.

22264. Was that what led to the adoption of Yellow Head Pass?—In part, and we had also information respecting the non-existence of a pass through the Selkirk range.

22265. Is not that the turning point in the question—the difficulty of getting through the Selkirk range: was not that the main fact established by the Moberly operations of that season?—No.

22266. What was the main fact?—I had very little hope of getting through the Selkirk range when we started the surveys.

22267. Well, what was the main fact?—It was a comparison of the respective merits of the two passes—Yellow Head and Howse—and we were enabled to do that by the surveys that were made, imperfect as they were.

22268. Am I right or wrong in supposing this: that the Howse Pass would have been abandoned even if it had been better than the Yellow Head Pass, because of this difficulty ascertained in the Selkirk range?—I do not think so; I think you are wrong. I think it would have kept the question open and put us to the expense of making further surveys in that direction.

22269. In one of the extracts from your report of 1872 which you have read, you say:

"The lowest pass discovered through the Selkirk range, although about 1,000 feet lower than the mountains adjoining, is reported to be at such an elevation that the ground falls on one side 1,600 feet in five miles, and on the other 2,300 feet in about six miles, thus proving the pass impracticable for a railway, unless with a tunnel at an enormous cost."

Now, in the face of that obstacle, do you say that Howse Pass, if it had been equal in merits to Yellow Head Pass, would have been adopted?—I simply say that that itself was not sufficient to settle the question as to which pass was the best. The Howse Pass line was not rendered impracticable by that; it was simply rendered a longer line.

22270. You mean by going by the Columbia River?—Yes.

22271. Round the bend?—Yes.

Moberly's profile showed a very difficult approach to Howse Pass.

22272. That would have been about 175 miles instead of a line across it at seventy-five miles?—Possibly about that. Then there were other matters that entered into the comparison. There would be the nature of the ascent to the Howse Pass from the Columbia River. The profile which Mr. Moberly sent me and which was made, as I was informed and believe, from actual instrumental surveys, showed me a very difficult section of railway, and I was enabled to compare that

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with the approaches to the Yellow Head Pass before recommending the Government to adopt one or the other.

22273. Well was not the difficulty which was found in the way of a railway through the Howse Pass that difficulty which you have described here as proving the impracticability of a route through the Selkirk range: was not that the main obstacle?—No, I do not think so. That was one of the obstacles. I never was very sanguine of getting a pass through that way. From the first I thought it would be necessary to follow the Columbia River to the Boat Encampment and from the Boat Encampment to the Eagle Pass.

22274. This difficulty which you say was a very serious one, and which might weigh very much in the decision as to which route to take, was discovered without instrumental surveys?—Without instrumental surveys. Before Mr. Moberly went there at all, I knew that there was every probability of finding a probable route from Kootanie Plain to Shuswap Lake—not across the Selkirk range, but across by Howse Pass—the Blaeberry River and Columbia River to the Boat Encampment, Boat Encampment to Little Dalles, and thence across by Eagle Pass to Shuswap Lake. Had we got a passage through the Selkirk range it would have rendered the route by Howse Pass to Burrard Inlet much shorter if not more favourable.

Had a passage been found through the Selkirk range the route by Howse Pass to Burrard Inlet would have been much shorter than that by the Yellow Head.

22275. Before leaving this matter of the crossing of the Selkirk range I would like to ask whether the crossing it in the way which you have suggested was not considered to be much more advantageous than going round the bend by the Boat Encampment?—We did not know. If it had been a practicable line, it would, of course, have been very much more favourable, it would have shortened the distance seventy-five or eighty or more miles.

2276. That was one of the objects to be ascertained, whether it was feasible?—That was one of the objects, but not the main object. The main object was to get information with regard to the Howse Pass, the Eagle Pass and intervening country by the Columbia. As I said before, I had very little hope of gaining the information I required. So as soon as the Government decided to adopt the Yellow Head Pass, and abandon all further expenditure on the survey of the Howse Pass, I wrote to Mr. McLennan, then on his way to British Columbia, a letter which I shall read. It was dated the same day that the Yellow Head Pass was adopted, the 2nd of April 1872:

Letter to McLennan informing him of the decision of the Government in favour of Yellow Head Pass.

"R. McLennan, Esq., Toronto.

"My Dear Sir,—I enclose a copy of a telegram which I have this day sent to Lieut.-Governor Trutch. You will see from this that the Government has decided to abandon all the surveys in connection with the Howse Pass, and to adopt Yellow Head Pass as the gateway from the east to British Columbia. The information resulting from the surveys made by yourself and Mr. Moberly has been such as to justify this decision. Kamloops, on the line to New Westminster, it is found, can be easier reached by Yellow Head Pass than Howse Pass from the longitude of Fort Edmonton. The distance is, as near as possible, the same one way as the other, and the measurements made establish the question of gradients, without a doubt, in favour of the Yellow Head Pass route. Of course, if New Westminster can be reached easiest by the Yellow Head Pass, every other point in British Columbia north of it can be still easier reached. This is so far satisfactory, it will enable us to concentrate our efforts on one route east of Tête Jaune Cache, and make Tête Jaune Cache a common point for all lines running towards the west"——

Now this is the point to which I wish to draw your attention—

"We must utilize the supplies taken in by Mr. Moberly, and I think this can be best done by moving them to Boat Encampment, and thence by Canoe River to the

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Directions how to utilize supplies taken in by Moberly; to survey route between Tête Jaune Cache and Bute Inlet, &c.

neighbourhood of Albreda or Cranberry Lakes, or by the Athabaska Pass to Henry House. I have pointed out in this telegram where the parties under Mr. Moberly and Mr. Trutch should operate, namely, between Kamloops, Cranberry Lake and Jasper House. This will leave your parties free to take up the survey on the most direct route that can be found between Tête Jaune Cache and Bute Inlet. I trust the exploration between Quesnelle Lake and the North Thompson will prove a success; if so you will follow it up towards Bute Inlet. Should there be no opening through the mountains nearer than Kamloops, you must then endeavour to ascertain the practicability of the line by Bonaparte River. I hope, however, if you fail to get through to the Quesnelle Lake from the North Thompson, you will be able to get through by Tranquille Lake, and Lake la Hache. Will you mention to the Lieut.-Governor that I regret very much that I cannot at once go to British Columbia myself The Government is now arranging, however, to secure the services of a gentleman to take general charge of all the surveys in British Columbia during my absence, and who will probably leave in a couple of weeks. He will take with him a sufficient number of assistants to make special surveys in the neighbourhood of Valdes Island with a view to bridging, and will himself take charge of the coast survey. He has now finished another engagement, and will proceed to British Columbia with as little delay as possible. I may make arrangements to start overland for British Columbia in June, and will probably reach Jasper House about the middle of August."

On the same day I sent the following telegram to Lieut.-Governor Trutch:—

"OTTAWA, April 2nd, 1872.

Telegram to Trutch announcing the choice of Yellow Head Pass and giving directions.

"To Lieut.-Governor TRUTCH, Victoria, B.C.:

"Information received from surveys shows that Kamloops can be easier reached from Edmonton by Yellow Head than by Howse Pass. Government has adopted Yellow Head Pass. Moberly's parties and supplies to be moved north by Canoe River or Athabaska Pass. One party will survey from Henry House towards Jasper and Edmonton, the other between Cranberry Lake and Henry House. John Trutch's parties will survey between Kamloops and Cranberry Lake, leaving Lower Fraser until later. McLennan's parties to find most direct route from above surveys to Tatla Lake and Bute Inlet. Special survey and soundings will be made at Valdes Islands with a view to bridging. McLennan *en route*."

To this Mr. Trutch replied as follows:—

"VICTORIA, April 5th, 1872.

Trutch to Fleming describing how surveys were disposed, &c.

"Yours dated yesterday received, and accordingly Trutch's two parties now at Yellow Head, directed to commence immediately at Kamloops. Moberly's party T to return by Kamloops to work from Cranberry Lake, and Moberly's new party to proceed hence by Kamloops to work eastward from Henry House. Moberly will rejoin party S and take them through Howse Pass to reach Edmonton about 1st July. To convey parties and supplies by Athabaska Pass to Henry House would take longer to make trail throughout from Blaeberry River. Moberly awaits your approval of above arrangement.

"J. W. TRUTCH."

I, thereupon sent the following:—

"OTTAWA, April 8th, 1872.

Telegram to Trutch deprecating Moberly's going round by Edmonton.

"Lieut.-Governor TRUTCH, Victoria, B.C.:

"Expedition returned from Kootanie Plain and Jasper House report roads wretched east of Kootanie Plain. Country flat, wet and swampy from Jasper to Edmonton. Engineering features perfectly satisfactory from Edmonton to ten miles east of Jasper, and no present necessity for further survey of it now. Want parties arranged in best manner to complete instrumental survey between latter point and Kamloops, and will be guided by your advice. Under above circumstances, I doubt the propriety of going around by Edmonton. Time from Boat Encampment to Henry House, through Athabaska Pass, ten or twelve days"——

This is the time given by the Hudson's Bay officers.

"I expect to reach Leather Pass by the middle of August."

And I say this was done after making every enquiry of Hudson Bay Co.'s officers and others with regard to the practicability of going one way or the other.

22277. Were those Hudson Bay Co.'s officers in Ottawa?—Yes, in Ottawa. I am not very sure who they were. Mr. Donald A. Smith was one, and, I think, Mr. Smith, now at Brockville, was the other; but

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am not quite sure as to the other, and I had some knowledge of my own. I have already mentioned that I had consulted Hudson Bay officers as to the best way of reaching Jasper Valley before sending the above telegram. They considered it would be madness to attempt a journey round by Edmonton through 500 or 600 miles, much of it swamp, when a 100 miles or 150 miles journey over a well known route would accomplish the same purpose. I have referred to these letters and telegrams because I am aware that it has been stated before the Commissioners that a grave mistake had been committed by me in insisting on Mr. Moberly not going round by Edmonton at the beginning of his work.

22278. I think you said that before devising the plan of operations for 1871, you had some information about the probable feasibility of the Yellow Head Pass as well as of the Howse Pass, which latter you obtained from Palliser's expedition?—Yes.

Information respecting feasibility of Yellow Head Pass possessed by witness before revising plan of operations of 1871.

22279. What was the nature of the information you had about the Yellow Head Pass?—The Yellow Head Pass had been traversed by several people, and I knew—I am not quite sure from whom I got this—but I knew approximately the elevation of the Yellow Head Pass was in the neighbourhood of 3,750 feet, that was then given. I think it was ascertained by Dr. Ray who went through that way some years before in connection with the telegraph scheme of the Hudson Bay Co.; and then again, I had some information, not with regard to precise heights or distances, but with regard to the features of the country, from reading the work of Milton and Cheadle, and I knew from the information thus acquired that there was a very fair chance of getting through in that way. It was worth the examination at all events, I felt satisfied, indeed, that it was feasible to carry a railway through the pass and down the Fraser River by Fort George, but that being a very roundabout way I was naturally desirous of ascertaining if a shorter cut to the Pacific could not be had.

Character of Survey.

22280. I understand, from your evidence, that the two principal objects of the operations of 1871 were to get further particulars about the Yellow Head Pass and about the Howse Pass; the party under Mr. Trutch confining their operations to the lower portion of the Thompson River, the other two parties to direct their attention—the one under Mr. Moberly to Howse Pass, and the one under Mr. McLennan to the Yellow Head Pass?—Yes; the object to be as you state, and it was with the view of making a comparison between the engineering features of the two passes that the expenditure was incurred.

Got sufficient information respecting Yellow Head Pass to justify deciding on it without an instrumental survey.

22281. Did you get any instrumental information of the Yellow Head Pass before it was fixed upon as the gateway?—We had information supplied by Mr. McLennan, which, though not of the character I expected, was sufficient to enable me to decide as to the merits of the two passes

22282. Then you got information sufficient to enable you to decide without an instrumental examination of the Yellow Head Pass?—Of that particular pass; but I had information from instrumental surveys of another pass. I discovered there was a possibility of getting from Tête Jaune Cache to the North Thompson. That was new information acquired by this survey.

22283. You mean the Albreda River?—Yes.